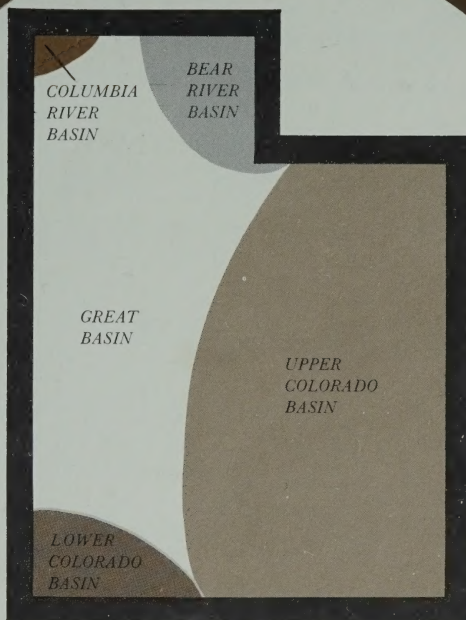


BLM LIBRARY



88078634



DEVELOPING A STATE WATER PLAN

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1969

COOPERATIVE INVESTIGATIONS REPORT NO. 7

TD
224
.U8
A4
no. 7

UTAH BOARD OF WATER RESOURCES

MEMBERS

Clyde E. Conover, *Chairman* Ferron
Marion Olsen, *First Vice-Chairman* Paradise
Elgin Gardner, *Second Vice-Chairman* Nephi
Wayne M. Wilson La Verkin
Angus H. Belliston Salina
Edward H. Southwick Ogden
Wendell H. Anderson Grantsville
Leo Brady Duchesne
Leo P. Harvey, *Ex-Officio Member* Pleasant Grove

UTAH DIVISION OF WATER RESOURCES

STAFF

Daniel F. Lawrence *Director*
Edwin B. Haycock *Planning Director*
Bert A. Page *Controller*
Ray E. Marsell *Geological Consultant*
Ethan F. Axtmann *Hydraulic Engineer*
Roland Palmer *Hydraulic Engineer*
James G. Christensen *Water Resources Planner*
Barry C. Saunders *Hydraulic Engineer*
Paul Gillette *Hydraulic Engineer*

DEVELOPING A STATE WATER PLAN

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1969

by

C. H. Baker, Jr., and others

United States Geological Survey

Prepared by the United States Geological Survey

in cooperation with the State of Utah

Published by

Division of Water Resources

Utah Department of Natural Resources

Cooperative Investigations Report Number 7

1969

BLM Library
Denver Federal Center
Bldg. 50, OC-521
P.O. Box 25047
Denver, CO 80225

CONTENTS

	Page
Introduction	1
Utah's ground-water reservoirs	2
Summary of conditions	4
Major areas of ground-water development	5
Cache Valley by L. J. Bjorklund	5
East Shore area, Weber Delta and Bountiful districts by E. L. Bolke	5
Jordan Valley by R. W. Mower	6
Tooele Valley by L. R. Herbert	6
Utah and Goshen Valleys by R. M. Cordova	7
Juab Valley by R. G. Butler	7
Sevier Desert by R. W. Mower	8
Sanpete Valley by E. L. Bolke	8
The upper and central Sevier Valleys by G. W. Sandberg	9
Pavant Valley by R. W. Mower	9
Cedar City Valley by G. W. Sandberg	10
Parowan Valley by G. W. Sandberg	10
Escalante Valley by G. W. Sandberg	11
Milford district	11
Beryl-Enterprise district	11
Other areas by R. G. Butler	12
References	12
Illustrations	13

ILLUSTRATIONS

Figure		Page
1.	Map of Utah showing areas of known or potential ground-water development	3
2.	Map of Cache Valley showing change of water levels from March 1968 to March 1969	14
3.	Graphs showing relation of water levels in well (A-12-1)29cab-1 to discharge of the Logan River near Logan and to cumulative departure from the 1931-60 normal annual precipitation at Logan Utah State University	16
4.	Map of the East Shore area, Weber Delta and Bountiful districts, showing change of water levels from March 1968 to March 1969	17
5.	Graphs showing relation of water levels in wells near Bountiful, Layton, Clearfield, Ogden, and Plain City to cumulative departure from the average annual precipitation at Ogden Pioneer powerhouse	18
6.	Graphs showing estimated population of Salt Lake County, water withdrawn from wells, and annual precipitation at Midvale for the period 1932-67	19
7.	Map of the Jordan Valley showing change of water levels from February 1968 to February 1969	20
8.	Graphs showing relation of water levels in selected wells in the Jordan Valley to cumulative departure from the 1931-60 normal annual precipitation at Silver Lake Brighton	21
9.	Map of Tooele Valley showing change of water levels in artesian aquifers from March 1968 to March 1969	22
10.	Graphs showing relation of water levels in selected wells in Tooele Valley to cumulative departure from the 1931-60 normal annual precipitation at Tooele	23
11.	Map of Utah and Goshen Valleys showing change of water levels in the water-table aquifers from March 1968 to March 1969	24
12.	Map of Utah and Goshen Valleys showing change of water levels in the shallow artesian aquifer in rocks of Pleistocene age from March 1968 to March 1969	26
13.	Map of Utah and Goshen Valleys showing change of water levels in the deep artesian aquifer in rocks of Pleistocene age from March 1968 to March 1969	28

ILLUSTRATIONS—Continued

Figure	Page
14. Map of Utah and Goshen Valleys showing change of water levels in the artesian aquifer in rocks of Tertiary age from March 1968 to March 1969	30
15. Graphs showing relation of water levels in selected observation wells to cumulative departure from the 1931-60 normal annual precipitation at Utah Lake Lehi and Payson	33
16. Map of Juab Valley showing change of water levels from March 1968 to March 1969	34
17. Graphs showing relation of water levels in wells (D-11-1)9bbb-4 and (C-15-1)12aba-1 to cumulative departure from the 1931-60 normal annual precipitation at Nephi and Levan	36
18. Map of part of the Sevier Desert showing change of water levels in the lower artesian aquifer from March 1968 to March 1969	37
19. Map of part of the Sevier Desert showing change of water levels in the upper artesian aquifer from March 1968 to March 1969	38
20. Graphs showing relation of water levels in selected wells in the Sevier Desert to cumulative departure from the 1931-60 normal annual precipitation at Oak City	39
21. Map of Sanpete Valley showing change of water levels from March 1968 to March 1969	40
22. Graphs showing relation of water levels in three wells in Sanpete Valley to cumulative departure from the 1931-60 normal annual precipitation at Manti	41
23. Map of the upper and central Sevier Valleys showing change of water levels from March 1968 to March 1969	42
24. Graphs showing relation of water levels in selected observation wells and of average annual discharge of the Sevier River at Hatch to cumulative departure from the 1931-60 normal annual precipitation at Piute Dam and Panguitch	44
25. Map of the Pavant Valley showing change of water levels from March 1968 to March 1969	45
26. Graphs showing relation of water levels in selected wells in Pavant Valley to cumulative departure from the 1931-60 normal annual precipitation at Fillmore	46

ILLUSTRATIONS—Continued

Figure	Page
27. Graphs showing concentration of dissolved solids in water from selected wells in Pavant Valley	48
28. Map of Cedar City Valley showing change of water levels from March 1968 to March 1969	49
29. Graphs showing relation of water levels in well (C-35-11)33aac-1 to cumulative departure from the 1931-60 normal annual precipitation at the Cedar City powerhouse, to annual discharge of Coal Creek near Cedar City, and to annual pumpage for irrigation in Cedar City Valley	50
30. Map of Parowan Valley showing change of water levels from March 1968 to March 1969	51
31. Graphs showing relation of water levels in well (C-34-8)5bca-1 to cumulative departure from the 1931-60 normal annual precipitation at Parowan and to pumpage for irrigation in Parowan Valley	52
32. Map of the Milford district, Escalante Valley, showing change of water levels from March 1968 to March 1969	53
33. Graphs showing relation of water levels in well (C-29-10)6ddc-2 to cumulative departure from the 1931-60 normal annual precipitation at Milford airport, to discharge of Beaver River at Rockyford Dam near Minersville, and to pumpage for irrigation in the Milford district, Escalante Valley	54
34. Map of the Beryl-Enterprise district, Escalante Valley, showing change of water levels from March 1968 to March 1969	55
35. Graphs showing relation of water levels in wells (C-35-17)25cdd-1 and (C-35-17)25dcd-1 to cumulative departure from the 1931-60 normal annual precipitation at Modena and to pumpage for irrigation in the Beryl-Enterprise district, Escalante Valley	56
36. Graphs showing relation of water levels in wells in selected areas of Utah to cumulative departure from average annual precipitation at sites in or near those areas	57

TABLES

Table	Page
1. Areas of known or potential ground-water development in Utah . . .	2
2. Well construction and withdrawal of water from wells in 1968 in major areas of ground-water development in Utah	4

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1969

by

C. H. Baker, Jr., and others
U. S. Geological Survey

INTRODUCTION

This report is the sixth in a series of annual reports that describe ground-water conditions in Utah. Reports in the series are prepared cooperatively by the U. S. Geological Survey and the Utah Division of Water Resources and are designed to provide data for interested parties, such as legislators, administrators, and planners, to keep abreast of changing ground-water conditions.

This report, like the others (see references, p. 12), contains information on well construction, ground-water withdrawals, water-level changes, and related changes in precipitation and streamflow. It also contains supplementary data that are related to ground-water use in some areas. In reports of this series, the inclusion of such supplementary data as graphs showing chemical quality of water and maps showing water-table configuration is intended only for those years or areas where applicable data are available and are important to a discussion of changing ground-water conditions.

The report includes individual discussions of the most important areas of ground-water withdrawal in the State for the calendar year 1968. Water-level fluctuations, however, are described for the period spring 1968 to spring 1969. Many of the data used in this report were collected by the Geological Survey in cooperation with the Division of Water Rights, Utah Department of Natural Resources.

The following reports dealing with ground water in the State were released by the Geological Survey during 1968:

Ground-water Conditions in Utah, spring of 1968, by R. M. Cordova and others: Utah Division of Water Resources Coop. Inv. Rept. 6.

Ground-water discharge toward Great Salt Lake through valley fill in the Jordan Valley, Utah, by R. W. Mower: U. S. Geol. Survey Prof. Paper 600-D, p. D71-D74.

Ground-water hydrology of the San Pitch River drainage basin, Sanpete County, Utah, by G. B. Robinson, Jr.: U. S. Geol. Survey Water-Supply Paper 1896.

Ground water in Tooele Valley, Tooele County, Utah, by J. S. Gates and O. A. Keller: Utah Dept. of Nat. Resources Water Circ. 2.

Hydrologic and climatologic data, 1967, Salt Lake County, Utah, by A. G. Hely, R. W. Mower, and C. A. Horr: U. S. Geol. Survey open-file report (duplicated as Utah Basic-Data Release 15).

Hydrologic reconnaissance of Deep Creek valley, Tooele and Juab Counties, Utah, and Elko and White Pine Counties, Nevada, by J. W. Hood and K. M. Waddell: Utah Dept. of Nat. Resources Tech. Pub. 24.

Hydrologic reconnaissance of Rush Valley, Tooele County, Utah, by J. W. Hood, Don Price, and K. M. Waddell: Utah Dept. of Nat. Resources Tech. Pub. 23.

Reconnaissance of the ground-water resources of the upper Fremont River valley, Wayne County, Utah, by L. J. Bjorklund: Utah Dept. of Nat. Resources Tech. Pub. 22.

Selected hydrologic data, southern Utah and Goshen Valleys, Utah, by R. M. Cordova: U. S. Geol. Survey open-file report (duplicated as Utah Basic-Data Release 16).

Thermal springs near Midway, Utah, by C. H. Baker, Jr.: U. S. Geol. Survey Prof. Paper 600-D, p. D63-D70.

Thickness of valley fill in the Jordan Vall  y east of the Great Salt Lake, Utah, by Ted Arnow and R. E. Mattick: U. S. Geol. Survey Prof. Paper 600-B, p. B79-B82.

UTAH'S GROUND-WATER RESERVOIRS

Small quantities of ground water can be obtained from wells throughout much of Utah, but large supplies that are of suitable chemical quality for irrigation, public supply, or industrial use, generally can be obtained only in specific areas. These areas of known or potential ground-water development are shown in figure 1 and named in table 1. Only a few wells outside of these areas yield large supplies of water of good chemical quality.

Less than 2 percent of the wells in Utah obtain water from consolidated rocks. The consolidated rocks that yield the most water are lava flows such as basalt, which contains interconnected vesicular openings or fractures; limestone, which contains openings enlarged by solution; and sandstone, which contains interconnected openings between the grains that form the rock. Most of the wells that tap consolidated rocks are in the eastern and southern parts of the State, in areas where water supplies cannot be readily obtained from unconsolidated rocks.

More than 98 percent of the wells in Utah draw water from unconsolidated rocks. These rocks may consist of boulders, gravel, sand, silt, or clay, or a mixture of some of all of these sizes. Wells obtain the largest yields from the coarser materials that are sorted into deposits of equal grain size. Most wells that tap unconsolidated rocks are in large intermountain basins, which have been partly filled with debris from the adjacent mountains.

TABLE 1.

*Areas of known or potential ground-water development
in Utah*

(locations are shown in fig. 1)

Area	Type of water-bearing rocks
1. Curlew Valley	Unconsolidated
2. Park Valley	Do.
3. Grouse Creek valley	Do.
4. Hansel Valley	Do.
5. Blue Creek valley	Do.
6. Sink Valley	Do.
7. Malad-Lower Bear River valley	Unconsolidated
8. Valley east of the Pilot Range	Do.
9a. East Shore area, Weber Delta and Bountiful districts	Do.
9b. East Shore area, Brigham district	Do.
10. Jordan Valley	Do.
11. Cache Valley	Do.
12. Bear Lake valley	Do.
13. Upper Bear River valley	Do.
14. Ogden Valley	Do.
15. Morgan Valley	Do.
16. Park City area	Do.
17. Kamas Valley	Do.
18. Heber Valley	Do.
19. North flank Uinta Mountains	Do.
20. South flank Uinta Mountains	Do.
21. Uinta Basin	Do.
22. Tooele Valley	Do.
23. Skull Valley	Do.
24. Dugway area	Do.
25. Fish Springs Flat	Do.
26. Sevier Desert	Do.
27. Rush Valley	Do.
28. Cedar Valley	Do.
29. Utah and Goshen Valleys	Do.
30. Juab Valley	Do.
31. Sanpete Valley	Do.
32. Central Sevier Valley	Do.
33. Upper Sevier Valleys	Do.
34. Deep Creek valley	Do.
35. White Valley	Do.
36. Snake Valley	Do.
37. Pine Valley	Do.
38. Wah Wah Valley	Do.
39. Escalante Valley, Beryl-Enterprise district	Do.
40. Escalante Valley, Milford district	Do.
41. Beaver Valley	Do.
42. Cedar City Valley	Do.
43. Parowan Valley	Do.
44. Upper Fremont Valley	Do.
45. Lower Fremont Valley	Consolidated
46. Spanish Valley	Unconsolidated
47. Castle Valley (Grand County)	Do.
48. Montezuma Creek area	Consolidated
49. Kanab area	Unconsolidated
50. St. George area	Do.
51. Pavant Valley	Do.
52. Colton area	Consolidated
53. Scipio area	Do.
54. Lisbon Valley	Do.
55. Monticello area	Do.
56. Blanding area	Do.
57. Bluff area	Do.

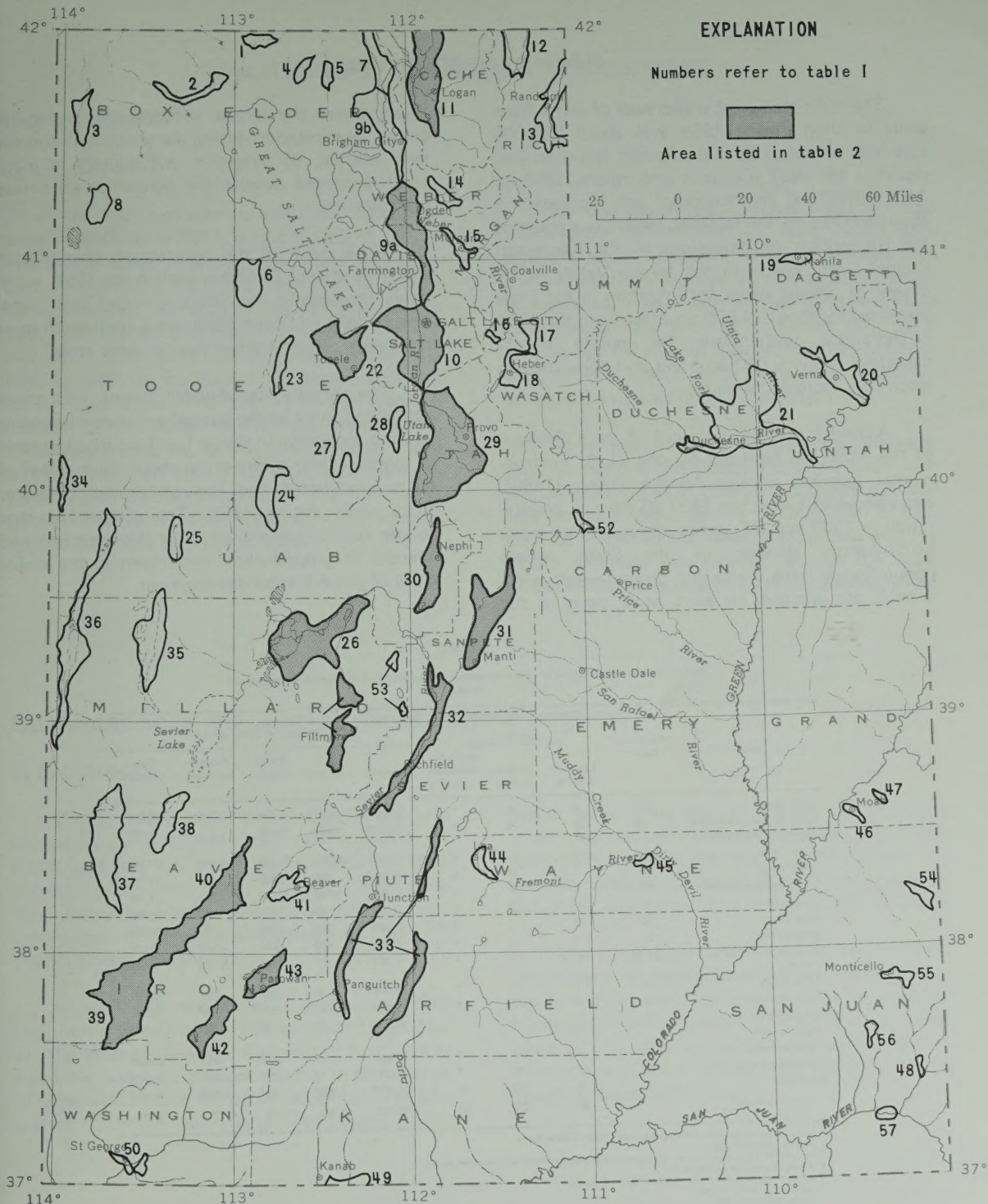


Figure 1.—Map of Utah showing areas of known or potential ground-water development.

SUMMARY OF CONDITIONS

The estimated total withdrawal of water from wells in Utah during 1968 was about 630,000 acre-feet, or about 20,000 acre-feet less than that reported for 1967 (Cordova and others, 1968, p. 14). Withdrawal for industrial use increased by about 6,000 acre-feet in 1968, largely as a result of the resumption of operations of the Kennecott Copper Corp. plants in the Jordan Valley. Withdrawal of ground water for irrigation in the State decreased by about 14,000 acre-feet from the 1967 withdrawals; withdrawals for public supply decreased nearly 5,000 acre-feet and domestic and stock uses decreased slightly.

Although precipitation in 4 of the 7 divisions of the State, as reported by the U. S. Environmental Sciences Service Administration (1969), was somewhat below the 1931-60 normal, precipitation in 1968 was 5.5 inches above normal in the north-central division of the State, where population is most dense and ground-water withdrawals are greatest. In most other parts of the

State, where the largest withdrawals are for irrigation, precipitation during the growing season was near normal, so irrigation withdrawals in many areas decreased despite the below-normal annual precipitation.

As a result of the near-normal precipitation and little change in withdrawals from 1967, water levels throughout the State changed little from March 1968 to March 1969; small declines in some areas were offset by small rises in other areas.

The larger ground-water basins and those containing most of the ground-water developments in Utah are shown in figure 1 and are listed in table 2, together with information about the number of wells constructed and the withdrawal of water from wells during 1968. The discussions that follow summarize ground-water development and changes in ground-water conditions in the major areas of ground-water development.

TABLE 2.

Well construction and withdrawal of water from wells in 1968 in major areas of ground-water development in Utah

Area	Number in figure 1	Number of wells completed ¹			Withdrawal from wells (acre-feet)				
		Diameter ²		New large-withdrawal wells ³	Irrigation	Industry	Public supply	Domestic and stock	Total (rounded)
		Less than 6 inches	6 inches or more						
Cache Valley	11	4	5	1	11,200	6,900	1,800	2,150	22,000
East Shore area, Weber Delta and Bountiful districts	9a	31	6	6	27,100 ^d	6,800	12,500	-	46,400
Jordan Valley	10	19	10	3	4,200	33,000	37,200	32,900 ^e	107,300
Tooele Valley	22	1	13	0	18,600 ^d	700	2,300	100	21,700
Utah and Goshen Valleys	29	6	19	4	47,800	6,700	6,500	12,700	73,700
Juab Valley	30	0	3	3	16,800	50	-	150	16,800
Sevier Desert	26	12	2	2	27,000	100	1,200	700	29,000
Sanpete Valley	31	4	1	1	8,800	400	500	3,500 ^e	13,000
Upper and central Sevier Valleys	32, 33	16	4	2	11,300	100	1,100	6,100	18,800
Pavant Valley	51	1	3	2	63,000	0	100	300	63,400
Cedar City Valley	42	0	21	6	28,500 ^f	100 ^f	800 ^f	150 ^f	29,800 ^f
Parowan Valley	43	0	5	1	21,300 ^{f, 7}	0	100 ^f	150 ^f	21,600 ^f
Escalante Valley									
Milford district	40	0	6	2	46,000 ^f	100 ^f	200 ^f	600 ^f	46,900 ^f
Beryl-Enterprise district	39	0	10	3	73,500 ^f	0 ^f	100 ^f	600 ^f	74,200 ^f
Other areas	-	4	120	16	38,900 ^g	1,200 ^g	7,100 ^g	1,000 ^g	48,000 ^g
Totals (rounded)		98	228	52	444,000	56,200	71,500	61,100	630,000

¹ Data from Utah Department of Natural Resources, Division of Water Rights.

² Includes replacement wells.

³ New wells (6 inches or more in diameter) constructed for irrigation, industrial, or municipal supply.

⁴ Includes some domestic and stock use.

⁵ Includes some use for fish and fur culture and air conditioning.

⁶ Includes some use for irrigation.

⁷ Includes some use for stock.

⁸ Estimated minimum amount.

MAJOR AREAS OF GROUND-WATER DEVELOPMENT

CACHE VALLEY

by L. J. Bjorklund

Flow from multiple-use wells was about the same in 1968 as in 1967, owing mostly to similar hydrostatic heads at artesian wells and to similar uses of water. Pumpage and flow from irrigation wells, however, was slightly less in 1968 than in 1967, owing mainly to heavy rains during the last half of August which caused many pumps and flowing wells to be turned off about a month earlier than usual. The total discharge from all wells in Cache Valley in Utah and Idaho during 1968 was about 26,700 acre-feet, about 1,900 acre-feet less than during 1967. In Utah, wells in Cache Valley discharged about 22,000 acre-feet of water during 1968, about 1,600 acre-feet less than in 1967 (Cordova and others, 1968, p. 17).

The changes in ground-water levels in Cache Valley from March 1968 to March 1969 were generally small; about half the changes were rises and half declines. Most of the area showed changes of less than 1 foot with neither gains nor losses consistent in any areas of significant size; therefore, in figure 2 most of the area is shown as having little or no change in water levels. Rises or declines of more than 1 foot occurred locally.

As in most of the observed wells, the water level in well (A-12-1)29cab-1 changed little from March 1968 to March 1969, although precipitation was almost 6 inches greater in 1968 than in 1967 (fig. 3). A rise in the water level in this well and others probably was delayed because the valley snowmelt in the spring of 1969 was relatively late.

EAST SHORE AREA, WEBER DELTA AND BOUNTIFUL DISTRICTS

by E. L. Bolke

During 1968, wells in the East Shore area discharged about 46,400 acre-feet of water, about 6,300 acre-feet less than that reported for 1967 (Cordova and others, 1968, p. 24); the decrease is due chiefly to smaller withdrawals from public-supply wells. The smaller withdrawals are the result of above-normal precipitation during 1968.

Water levels rose in most parts of the East Shore area from March 1968 to March 1969 (fig. 4). The greatest rises occurred west of Roy, east of Kaysville, and west of Woods Cross. In the absence of large withdrawals for public supplies in the area east of Clearfield where large withdrawals usually

occur, water levels showed a slight rise or only a small decline, contrasting with large water-level declines reported in this area in previous years. The greatest declines occurred in the heavily pumped industrial area at and to the east of Woods Cross.

The long-term relation between precipitation and water-level fluctuations in wells is illustrated in figure 5. The general rise in part of the area and the diminished rate of decline in water levels in other parts of the area are attributed partly to above-normal precipitation during 1968 and partly to the resulting decrease in pumpage.

JORDAN VALLEY

by R. W. Mower

The discharge from wells in the Jordan Valley in 1968 was 107,300 acre-feet, an increase of 4,400 acre-feet, or about 4 percent, over that reported for 1967 (Cordova and others, 1968, p. 29). The amount of ground water used for public supplies was 1,300 acre-feet more in 1968 than in 1967, and the population of Salt Lake County increased by about 4,000 (fig. 6). The largest increase in pumpage was by industry; water use by industry in 1968 was 4,200 acre-feet more than that reported for 1967, due principally to the resumption of milling operations by Kennecott Copper Corp. following a settlement of the strike by copper workers early in 1968. Ground-water use for irrigation was about 95 percent of that reported for 1967.

From February 1968 to February 1969 water levels rose in 83 percent of the Jordan Valley and declined in 17 percent of the valley (fig. 7); the net average change in the valley was a rise of 0.8 foot. The largest rises were in the southern part of the

West Slope district. The largest declines were in a small area in the southeastern part of the Northwest Lake Plain district. Most of the rises were in areas where pumpage was less and where recharge was greater than that in 1967, but rises in the southern part of the West Slope district during 1968 probably reflect increased recharge from canals and irrigated fields because of the above-normal supplies of surface water.

The long-term relations between fluctuations of precipitation and water levels are illustrated in figure 8 by the graph showing the cumulative departure from normal annual precipitation at Silver Lake Brighton and hydrographs of the water levels in selected wells in the Jordan Valley. Precipitation during 1968 was 10.11 inches above normal, and this increase accounts for the steep rise in the precipitation graph. The above-normal precipitation and consequent diminished pumping in most parts of the valley are reflected by a rise of water levels in all five wells.

TOOELE VALLEY

by L. R. Herbert

The discharge of 21,700 acre-feet from wells in Tooele Valley in 1968 was about the same as that reported for 1967 (Cordova and others, 1968, p. 36). Because of above-normal precipitation and an increased supply of surface water, the demand for water from pumped wells was less. The discharge from flowing wells, however, increased because artesian heads were increased both by increased recharge and by decreased pumping.

The discharge from springs in 1968 was approximately 14,600 acre-feet, an increase of about 1,700 acre-feet. Of this amount, about 4,900 acre-feet was used for irrigation and stock watering in the valley, and about 9,700 acre-feet was diverted to the Jordan Valley for industrial use.

Water levels in most of Tooele Valley changed little from March 1968 to March 1969 (fig. 9). In the normally heavily pumped areas near Erda and Grantsville, water levels rose as a result of decreased pumpage and increased recharge. Heavy pumping near Lake Point resulted in a decline of water levels in that area.

The long-term relations between water levels in selected wells and precipitation at Tooele are shown in figure 10. The precipitation at Tooele in 1968 was 6.30 inches more than the 1931-60 normal, and as a result, water levels rose in most of the measured wells. Some declines occurred in areas influenced by local pumping.

UTAH AND GOSHEN VALLEYS

by R. M. Cordova

The discharge from wells in Utah and Goshen Valleys in 1968 was about 73,700 acre-feet; about 3,100 acre-feet less in Utah Valley and 3,700 acre-feet less in Goshen Valley than in 1967 (Cordova and others, 1968, p. 41). Precipitation in 1968 was above normal, so more water was available from streams and springs and less supplemental water was needed from wells. In Goshen Valley, part of the decrease in discharge for irrigation was the result of the increased use of sprinkler irrigation.

Between March 1968 and March 1969 water levels in observation wells rose in Utah Valley (figs. 11, 12, 13, 14, and 15) but declined in Goshen Valley (fig. 11). The general water-level rise in Utah Valley was the result of above-normal precipitation (fig. 15) and a decrease in the withdrawal of water from wells in 1968; the largest rises occurred in the deeper artesian aquifers (figs. 13 and 14). The general decline in Goshen Valley was the result of heavy pumping of irrigation wells. Although pumpage was less in 1968 than in 1967, water levels declined because discharge exceeded recharge.

JUAB VALLEY

by R. G. Butler

The discharge from pumped and flowing wells in Juab Valley during 1968 was about 16,800 acre-feet, about 3,900 acre-feet less than that reported for 1967 (Cordova and others, 1968, p. 53). The decline in the total amount of water discharged from wells resulted from above-normal precipitation and a consequent decrease in the amount of ground water needed for irrigation.

From March 1968 to March 1969 water levels rose in every well observed, with the greatest

change centering in the Nephi and Levan areas (fig. 16). The rise in water levels resulted from above-normal precipitation and a decrease in the amount of water pumped for irrigation.

The long-term relations between water levels in selected wells in Juab Valley and precipitation at Nephi and Levan are shown in figure 17. Increased precipitation at both stations resulted in water-level rises in the wells.

SEVIER DESERT

by R. W. Mower

Total withdrawal of ground water in the Sevier Desert for all purposes during 1968 was 29,000 acre-feet, about 2,900 acre-feet less than that reported for 1967 (Cordova and others, 1968, p. 59). Pumpage for irrigation in 1968 decreased about 9 percent from the amount in 1967 because surface water was more plentiful in 1968.

Water levels rose in both the lower and upper artesian aquifers from March 1968 to March 1969 in most parts of the Sevier Desert (figs. 18 and 19). The maximum rise in the lower artesian aquifer was slightly more than 2 feet in areas between Delta and Lynndyl and west of Delta. The maximum rise in the upper artesian aquifer was slightly more than 2 feet in an area of about 9 square miles near the foot of the Canyon

Mountains between Oak City and Leamington. Water levels in the upper artesian aquifer declined slightly more than 1 foot near the eastern margin of the basin between Delta and Oak City and in the vicinity of Hinckley. Water levels declined less than 1 foot in the lower artesian aquifer near the southern margin of the basin south of Deseret.

During 1968 the precipitation at Oak City was 29 percent above normal and probably resulted in above-normal recharge. Although recharge may have been above normal, water levels in 2 of the 3 observation wells continued a downward trend that began in the early 1950's (fig. 20), indicating that withdrawals from wells during the past year have caused total discharge to exceed recharge in some parts of the Sevier Desert.

SANPETE VALLEY

by E. L. Bolke

During 1968, wells in Sanpete Valley discharged about 13,000 acre-feet of water, 1,700 acre-feet less than that reported for 1967 (Cordova and others, 1968, p. 67). The difference is due to decreased pumpage for irrigation during 1968, because precipitation was above normal and less ground water was used to supplement surface-water supplies.

Water levels generally rose from March 1968 to March 1969 in Sanpete Valley (fig. 21), the greatest rises occurring in the Mount Pleasant-Fairview area. Small declines occurred only in an

area around Chester and in a small area northeast of Sterling. The general rise of water levels was due to recharge from above-normal precipitation (1.14 inches above the 1931-60 normal at Manti) and decreased pumping for irrigation.

Hydrographs of water levels in 2 pumped irrigation wells and 1 small-diameter flowing well in Sanpete Valley and the long-term trend of precipitation at Manti are shown in figure 22. The rises in water levels in the two irrigation wells are primarily due to decreased pumpage during 1968.

THE UPPER AND CENTRAL SEVIER VALLEYS

by G. W. Sandberg

Wells in the upper and central Sevier Valleys discharged about 18,600 acre-feet of water during 1968, the same as in 1967 (Cordova and others, 1968, p. 71).

Water levels rose in 24 wells, declined in 5 wells, and remained the same in 1 well from March 1968 to March 1969 (fig. 23).

The relations among water levels in selected observation wells, average annual discharge of the Sevier River at Hatch, and precipitation at Panguitch and Piute Dam are shown in figure 24. Precipitation at Panguitch was about the same in 1968 as in 1967, and the precipitation trend is reflected by similar trends in the discharge of the Sevier River and in water levels in well (C-34-5)8adb-2. Increased precipitation at Piute Dam is reflected by a water-level rise in well (C-21-1)27aad-1.

PAVANT VALLEY

by R. W. Mower

The withdrawal of ground water in Pavant Valley during 1968 was 63,400 acre-feet, 14,000 acre-feet less than that reported for 1967 (Cordova and others, 1968, p. 75). Pumpage from irrigation wells in 1968 was less than that reported for 1967 because less water was needed from wells to supplement irrigation supplies from streams.

Water levels rose from March 1968 to March 1969 in about 60 percent of Pavant Valley (fig. 25) and declined in about 40 percent of the valley. There was an average net rise of water levels of 1.8 feet in contrast to an average decline of 1.3 feet observed from March 1967 to March 1968.

Maximum observed rises from March 1968 to March 1969 were more than 8 feet in the Flowell and Meadow districts and 4 feet in the Greenwood district. Maximum declines were more than 2 feet in the McCornick and Greenwood districts, more

than 1 foot in the Pavant district, and less than 1 foot in the Flowell and Kanosh districts. No declines were observed in the Meadow district.

The maximum declines were in areas where pumped irrigation wells are concentrated and where the amount of recharge was small. The maximum rises were in areas where pumped irrigation wells are used principally to supplement surface water and where the amount of recharge was large.

The concentration of dissolved solids in ground water in Pavant Valley increased from 1968 to 1969 in well (C-19-4)31dbb-1 in the Greenwood district and in well (C-23-6)21bdd-1 in the Kanosh district, both in areas where water levels declined. The concentration of dissolved solids decreased in well (C-21-5)30dbc-3 in the Flowell district, where water levels rose (figs. 26 and 27).

CEDAR CITY VALLEY

by G. W. Sandberg

Pumpage from wells in Cedar City Valley during 1968 was about 29,600 acre-feet, about 3,800 acre-feet more than that reported for 1967 (Cordova and others, 1968, p. 84). The increase in pumpage was for irrigation; water pumped for other uses remained about the same as for 1967.

Water levels rose in most of the valley from March 1968 to March 1969 (fig. 28). The greatest rises were in areas recharged by water from Coal Creek and streams near Kanarraville. Declines occurred in the northern part of the valley, where there is little recharge, and in an area near Hamilton Fort.

PAROWAN VALLEY

by G. W. Sandberg

Wells in Parowan Valley discharged about 21,600 acre-feet of water in 1968, about 4,000 acre-feet more than that reported for 1967 (Cordova and others, 1968, p. 88). The increase was entirely in pumpage for irrigation, which was the highest of record.

Water levels rose in nearly all parts of the valley from March 1968 to March 1969 (fig. 30). The largest rise, more than 4 feet, was in a well between Paragonah and Parowan. This area probably receives recharge from streams in both

The relations among water-level fluctuations in well (C-35-11)35aac-1, cumulative departure from normal precipitation near Cedar City, annual discharge of Coal Creek, and annual pumpage for irrigation are shown in figure 29. Pumpage for irrigation in Cedar City Valley in 1968 was the highest of record, even though the discharge of Coal Creek was above average. The above-average stream discharge was due primarily to very high spring runoff; during the summer months when irrigation demands were greatest, flow in Coal Creek was lower than usual. Flash floods in August contributed considerably to the annual streamflow, but little of this water could be diverted for irrigation. The high spring and summer flows, however, contributed measurably to ground-water recharge in the valley.

the Paragonah and Parowan areas. The largest decline, between 1 and 2 feet, was in a well north of Summit, where little or no surface water is available for recharge.

The long-term relations among fluctuations of water levels, precipitation, and pumpage are illustrated in figure 31. The water level in well (C-34-8)5bca-1 rose nearly 4 feet. The general rise of water levels throughout the valley, in spite of the record-high pumpage, was due to above-normal precipitation and surface runoff.

ESCALANTE VALLEY

by G. W. Sandberg

MILFORD DISTRICT

Annual pumpage in the Milford district during 1968 was about 46,900 acre-feet, about the same as that reported for 1967 (Cordova and others, 1968, p. 92).

Water levels generally rose in the east side of the district and declined on the west side from March 1968 to March 1969 (fig. 32). The rise along the east side was caused by recharge from irrigation with surface water; this area normally receives little surface water, but canal supplies were available during most of the irrigation season in 1968.

The relations among water levels in well (C-29-10)6ddc-2, discharge of the Beaver River, pumpage for irrigation, and precipitation at Milford are shown in figure 33. Precipitation at Milford was slightly less in 1968 than in 1967. Water levels are affected little by precipitation, however; they are changed most by recharge from surface water, as shown by the water level in well (C-29-10)6ddc-2, near the middle of the pumped area.

BERYL-ENTERPRISE DISTRICT

The amount of water pumped from wells in the Beryl-Enterprise district during 1968 was 74,200 acre-feet, an increase of about 2,800 acre-feet over that reported for 1967 (Cordova and others, 1968, p. 96). The additional water pumped in 1968 was for irrigation.

Water levels declined in most of the district from March 1968 to March 1969 (fig. 34), because of heavy pumpage throughout the district. The large depression that appeared in the water table in 1964 continued to expand, affecting most of the district in Tps. 35 and 36 S. Water levels rose

considerably in the vicinity of Enterprise, in the southern part of the district. The rise is attributed to early spring runoff from the area south and west of Enterprise with consequent flooding in Shoal Creek and recharge to the area near Enterprise.

The long-term relations among water levels, precipitation, and pumpage are shown in figure 35. Although precipitation was above normal, the decline of the water level in well (C-35-17)25ccd-1 from March 1968 to March 1969 was nearly as large as in most previous years; the large amount of pumpage exceeds recharge to the district and causes the continued downward trend.

OTHER AREAS

by R. G. Butler

Total discharge from wells in other parts of Utah during 1968 is not known; an estimated minimum figure is 48,000 acre-feet. This figure is 7,500 acre-feet more than that reported for 1967 (Cordova and others, 1968, p. 99), and the increase is due to the number of large-diameter wells completed and in use during 1968.

Water levels rose slightly in the St. George and Blanding areas, although precipitation was below normal at St. George and nearly normal at Blanding. Water levels also rose slightly in Morgan and Heber Valleys, and precipitation was above normal in both valleys.

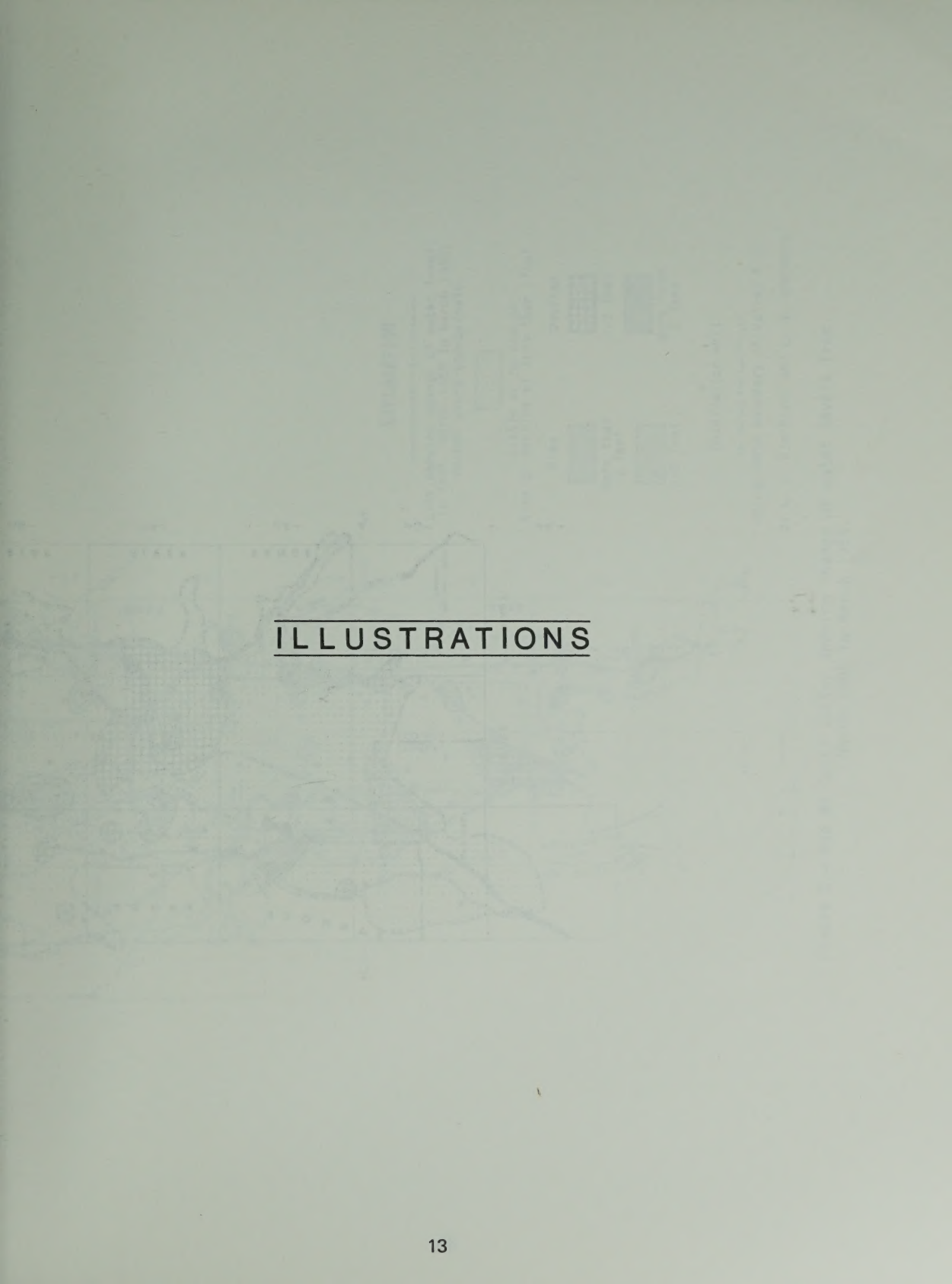
Water levels remained nearly unchanged in the Monticello area, on the south flank of the Uinta

Mountains, and in Cedar, Park, and upper Fremont Valleys. Precipitation was above normal in the three valleys and below normal in the other two areas.

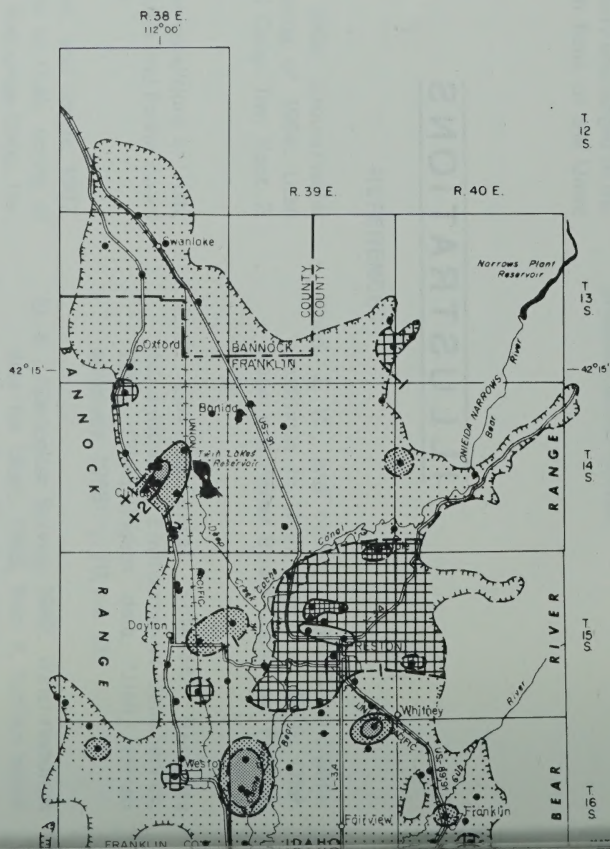
Precipitation was below normal and water levels declined in Beaver Valley, upper Bear River valley, and the Uinta Basin. Although precipitation was above normal in the Dugway area and in Ogden, Snake, Bear Lake, and Grouse Creek Valleys, water levels declined in all these areas. Water levels also declined slightly in Curlew Valley, and, although precipitation records for the year were incomplete, regional precipitation trends suggest that precipitation at Snowville was probably above normal.

REFERENCES

- Arnow, Ted, and others, 1964, Ground-water conditions in Utah, spring of 1964: Utah Water and Power Board Coop. Inv. Rept. 2, 104 p.
- 1965, Ground-water conditions in Utah, spring of 1965: Utah Water and Power Board Coop. Inv. Rept. 3, 99 p.
- Baker, C. H., Jr., Price, Don, and others, 1967, Ground-water conditions in Utah, spring of 1967: Utah Div. Water Resources Coop. Inv. Rept. 5, 89 p.
- Cordova, R. M., and others, 1968, Ground-water conditions in Utah, spring of 1968: Utah Div. Water Resources Coop. Inv. Rept. 6, 105 p.
- Hood, J. W., and others, 1966, Ground-water conditions in Utah, spring of 1966: Utah Water and Power Board Coop. Inv. Rept. 4, 95 p.
- U. S. Environmental Science Services Administration, Environmental Data Service, 1969, Climatological data, Utah (annual summary, 1968): v. 70, no. 13.
- U. S. Geological Survey, 1969, Water-resources data for Utah, 1968, Part 1, Surface water records: Water Resources Div.



ILLUSTRATIONS



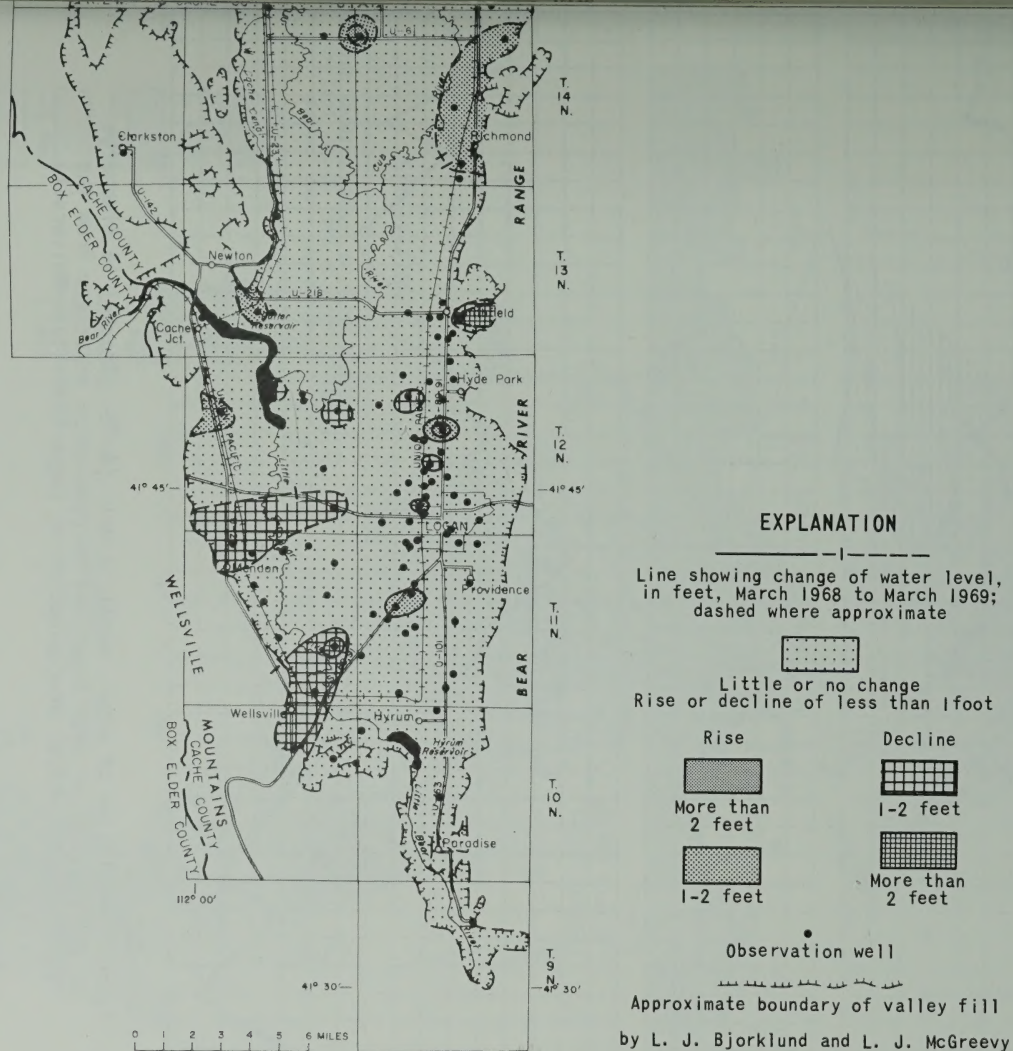


Figure 2.—Map of Cache Valley showing change of water levels from March 1968 to March 1969.

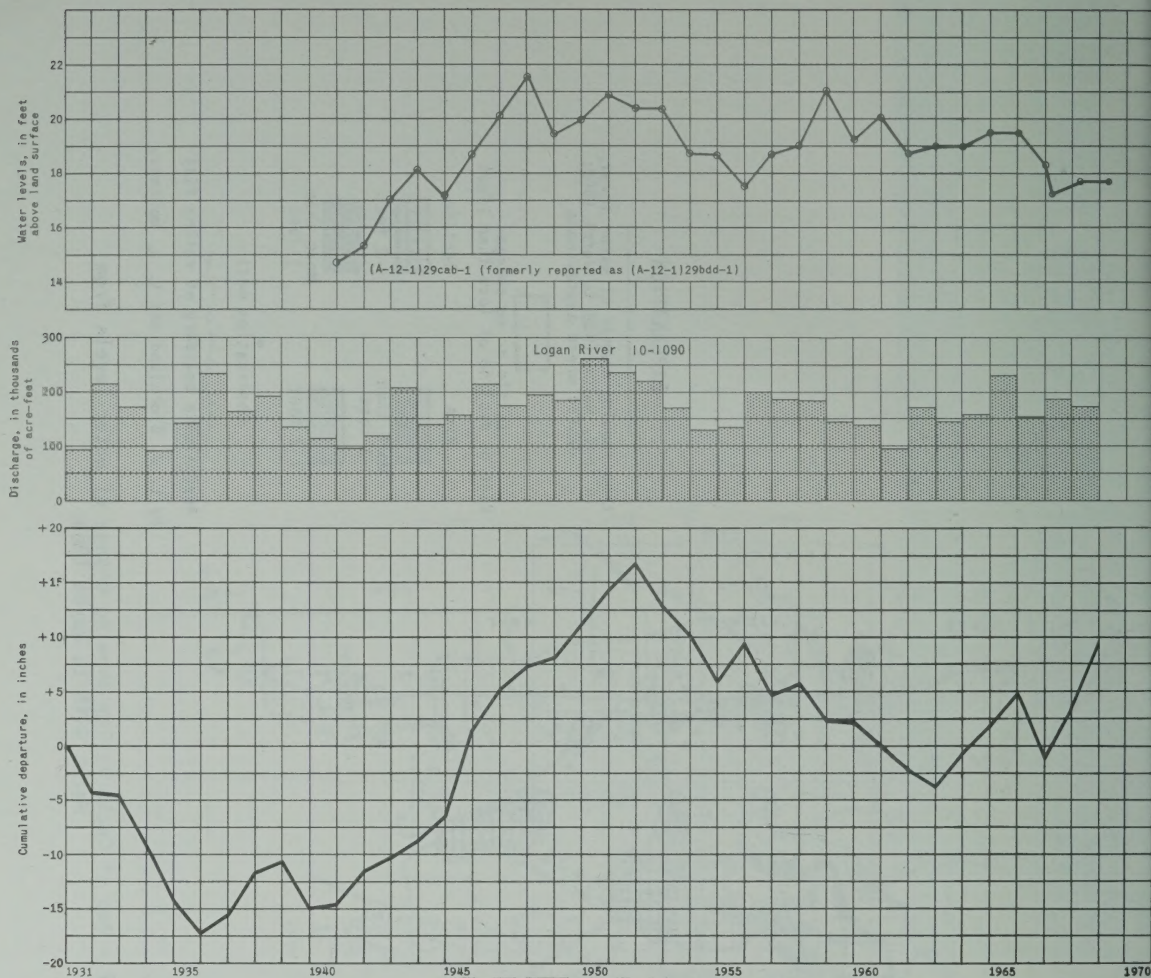


Figure 3.—Relation of water levels in well (A-12-1)29cab-1 to discharge of the Logan River near Logan and to cumulative departure from the 1931-60 normal annual precipitation at Logan Utah State University.

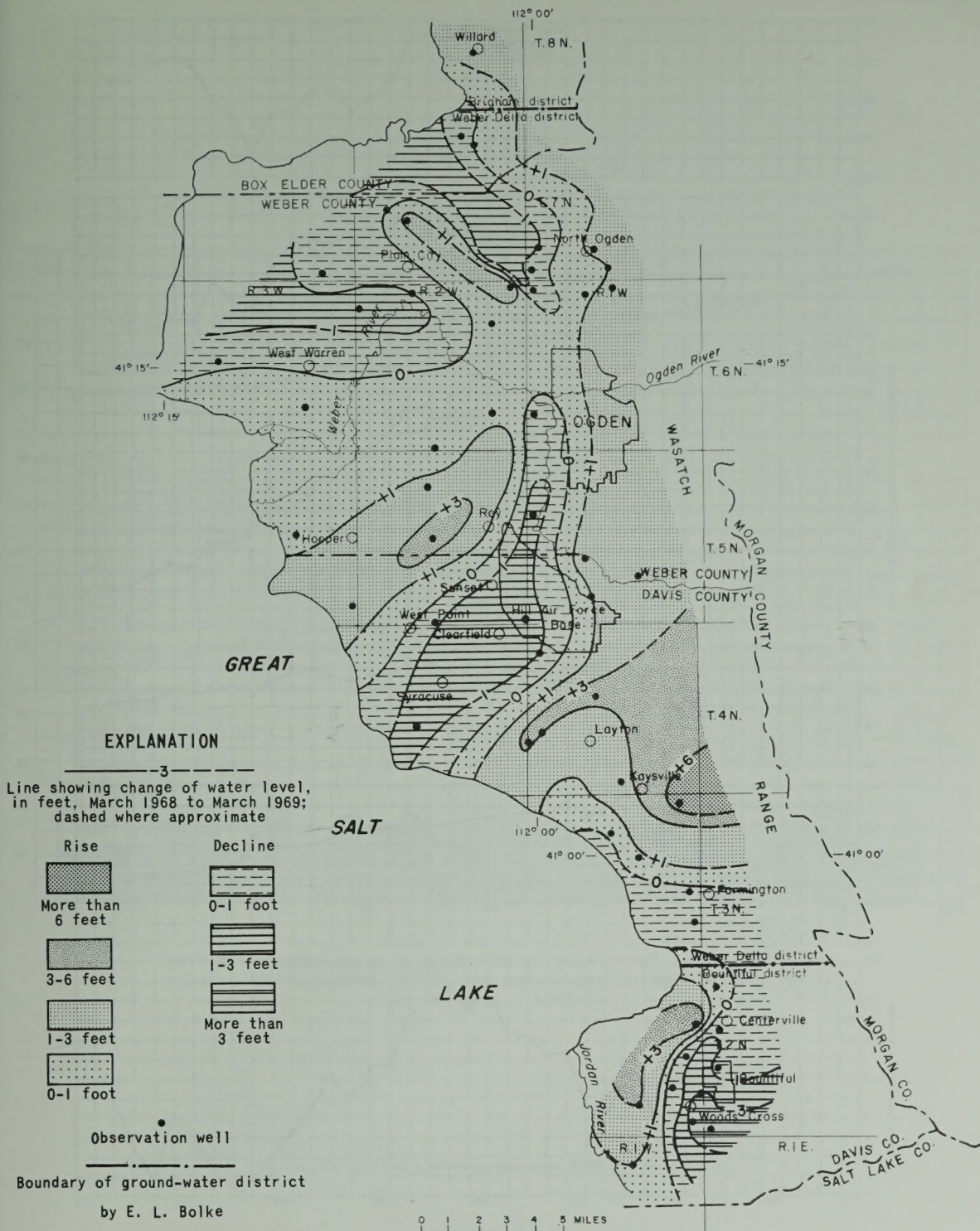


Figure 4.—Map of the East Shore area, Weber Delta and Bountiful districts, showing change of water levels from March 1968 to March 1969.

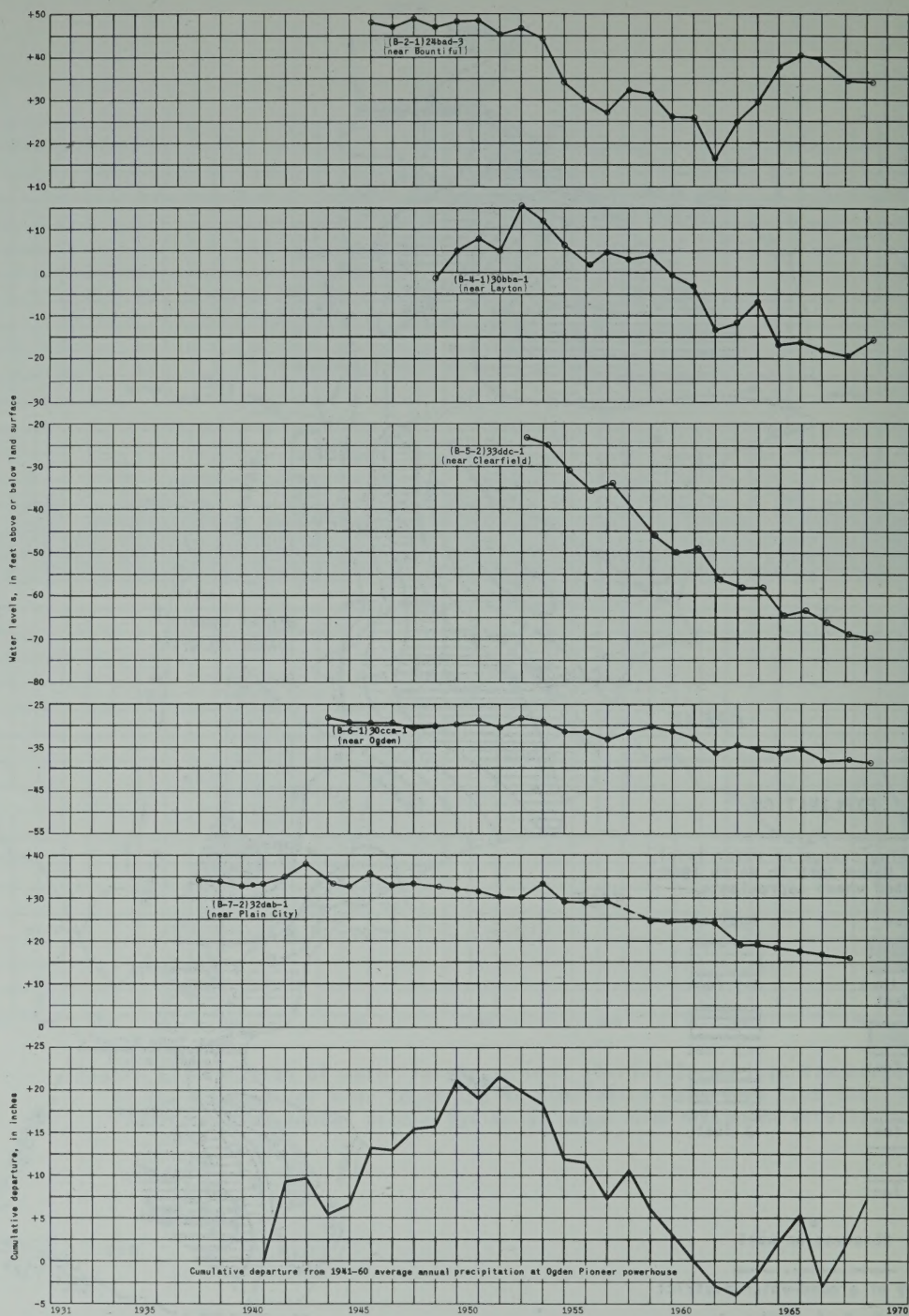


Figure 5.—Relation of water levels in wells near Bountiful, Layton, Clearfield, Ogden, and Plain City to cumulative departure from the average annual precipitation at Ogden Pioneer powerhouse.

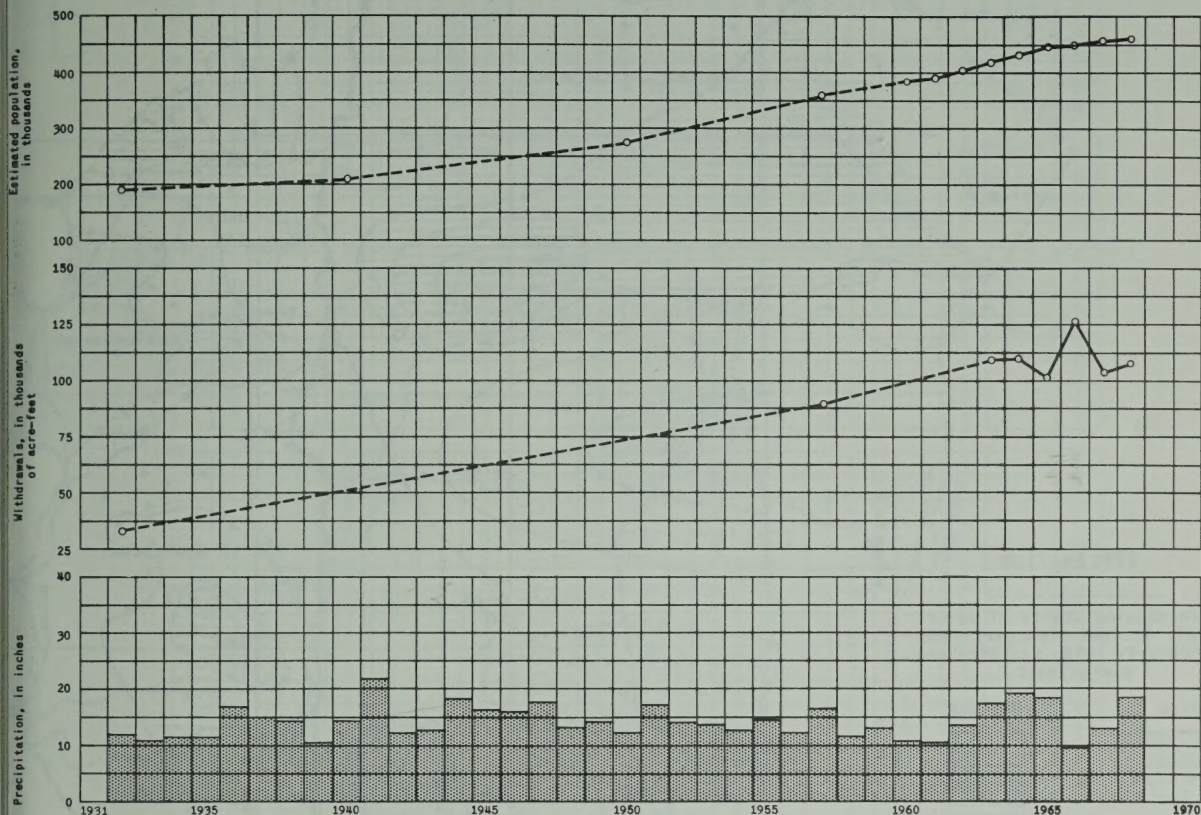


Figure 6.—Graphs showing estimated population of Salt Lake County, water withdrawn from wells, and annual precipitation at Midvale for the period 1932-67.

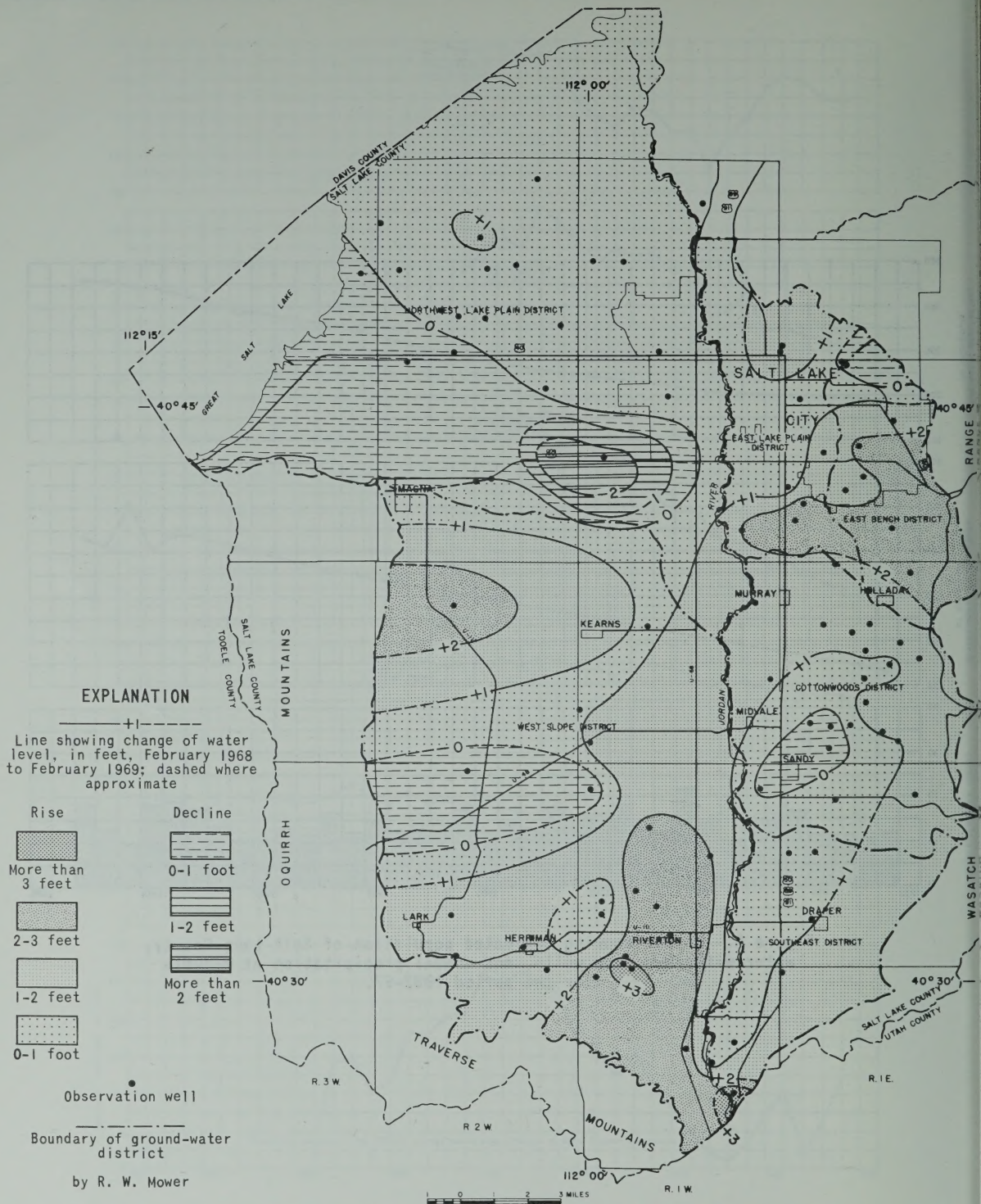


Figure 7.—Map of the Jordan Valley showing change of water levels from February 1968 to February 1969.

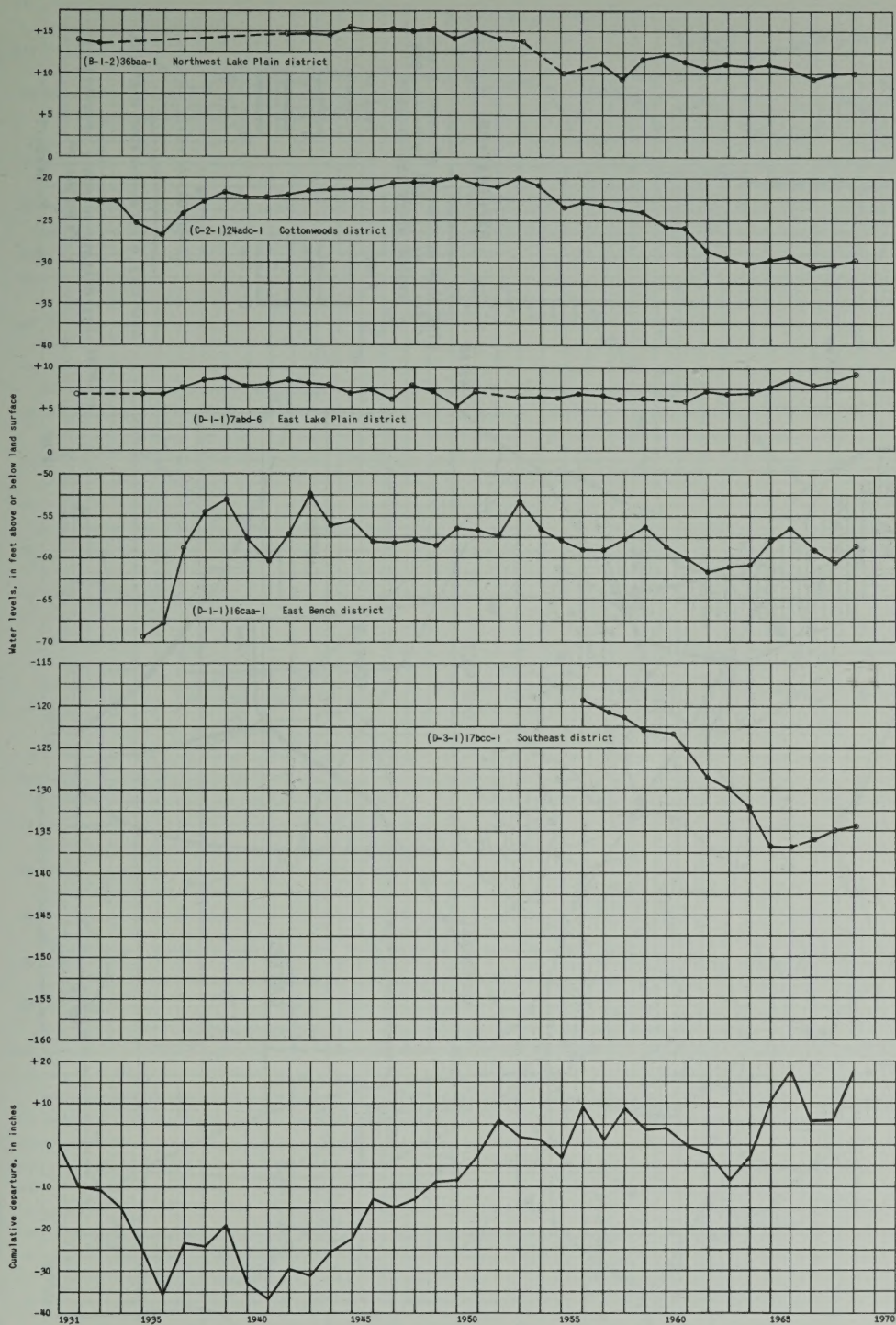


Figure 8.—Relation of water levels in selected wells in the Jordan Valley to cumulative departure from the 1931-60 normal annual precipitation at Silver Lake Brighton.

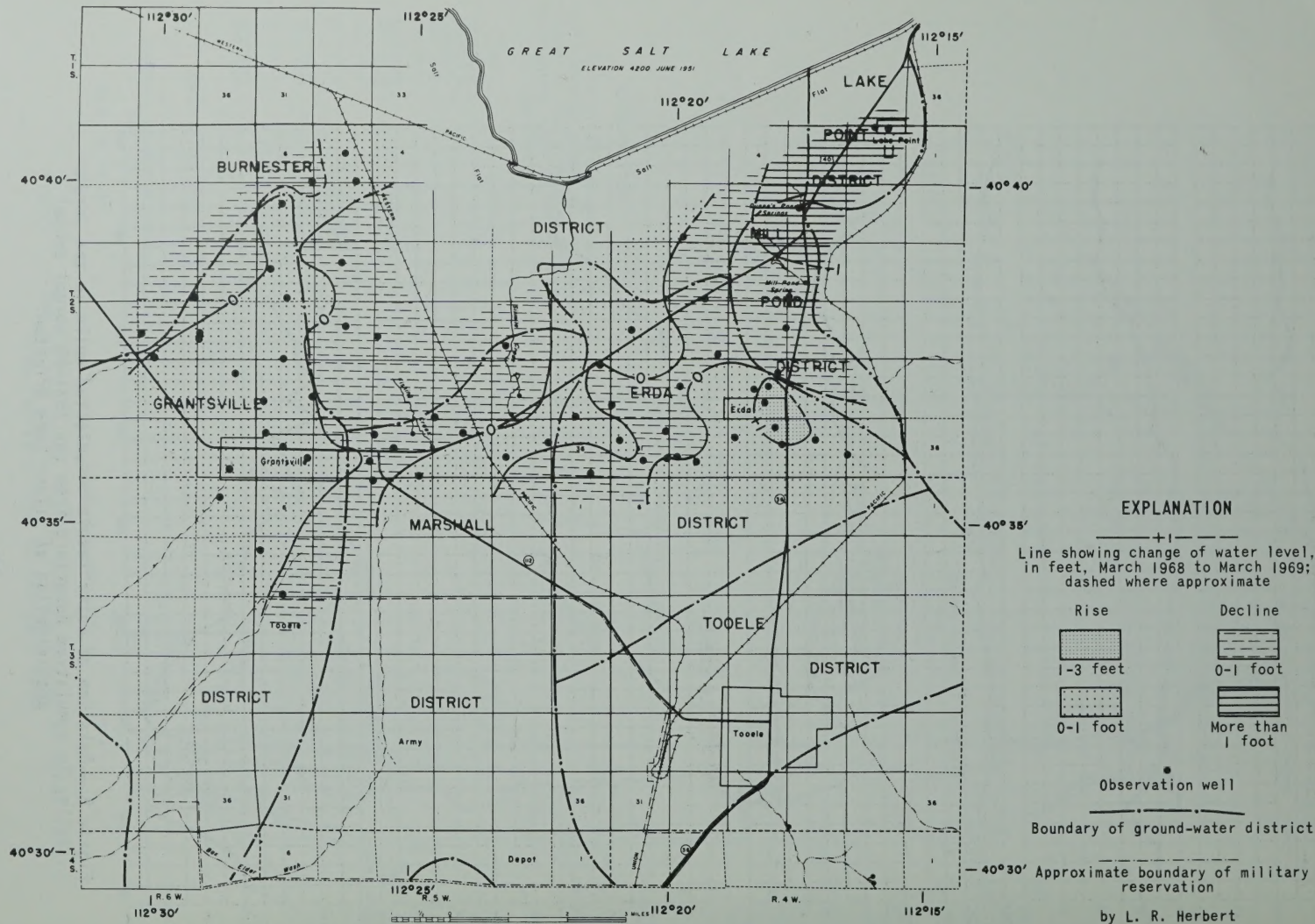


Figure 9.—Map of Tooele Valley showing change of water levels in artesian aquifers from March 1968 to March 1969.

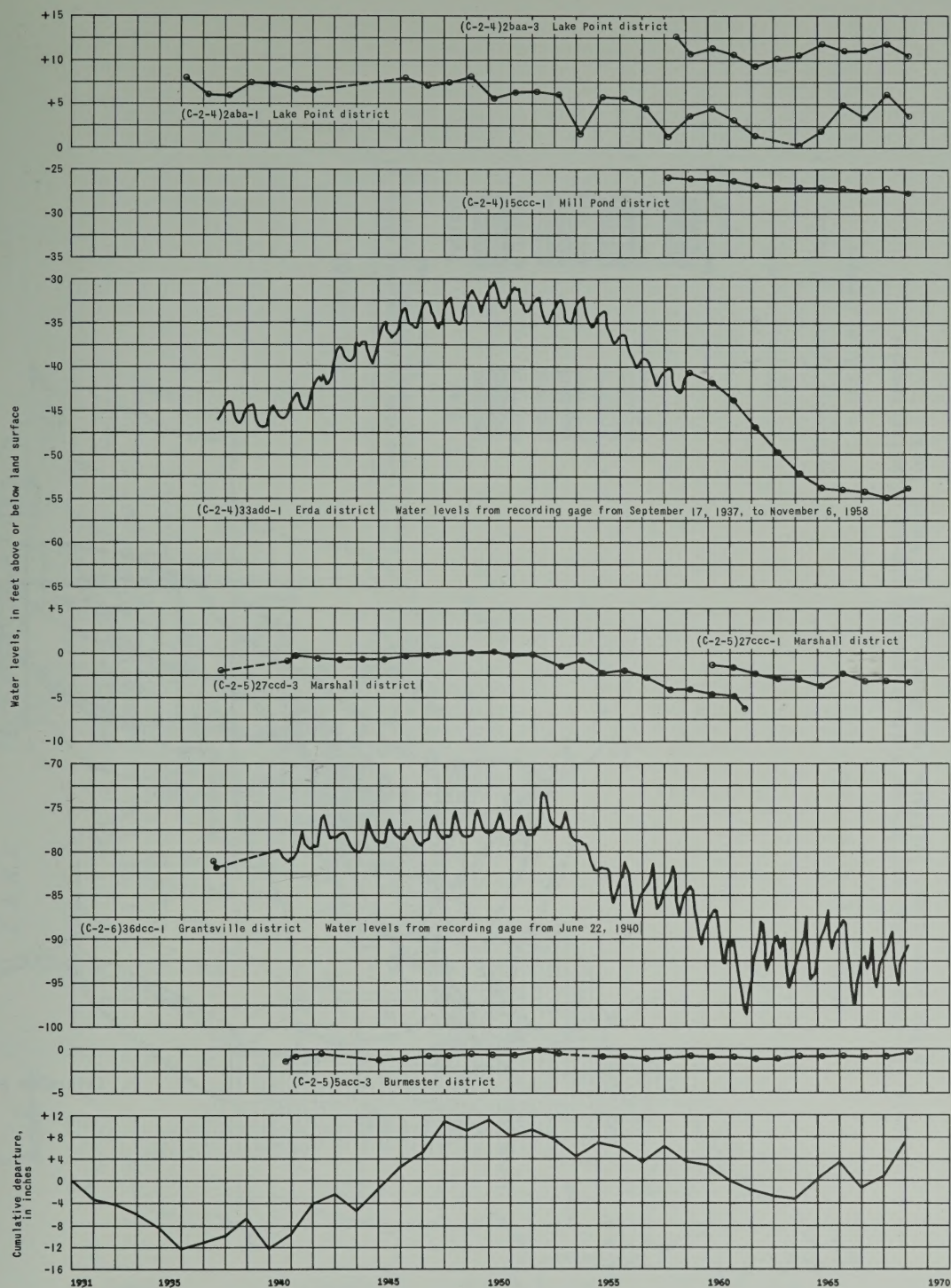
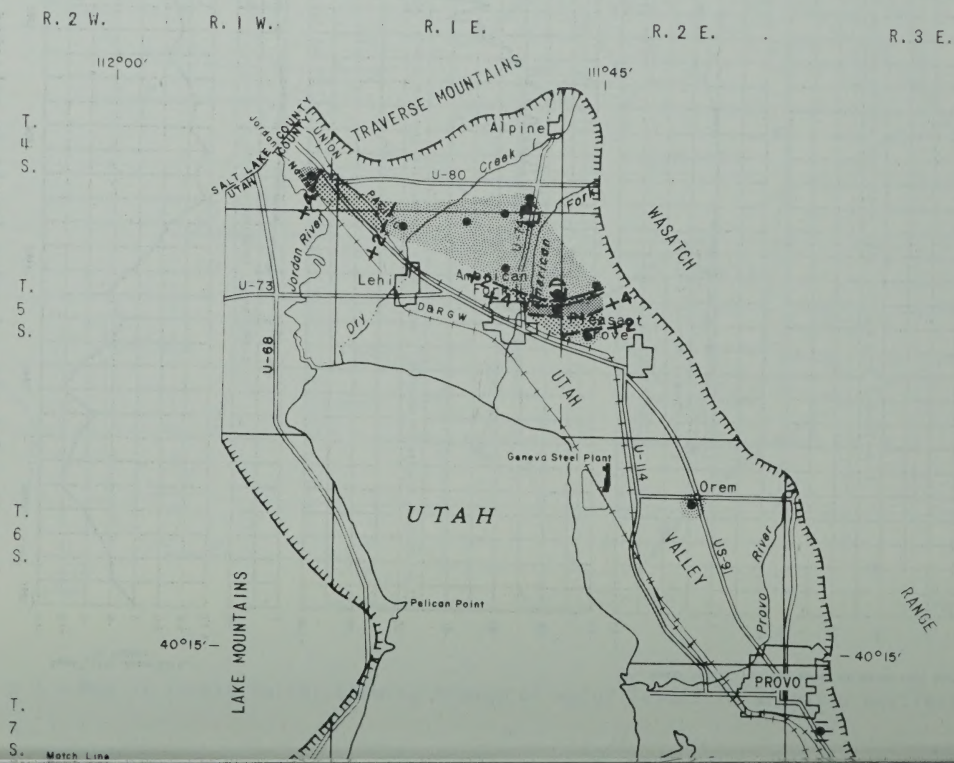


Figure 10.—Relation of water levels in selected wells in Tooele Valley to cumulative departure from the 1931-60 normal annual precipitation at Tooele.



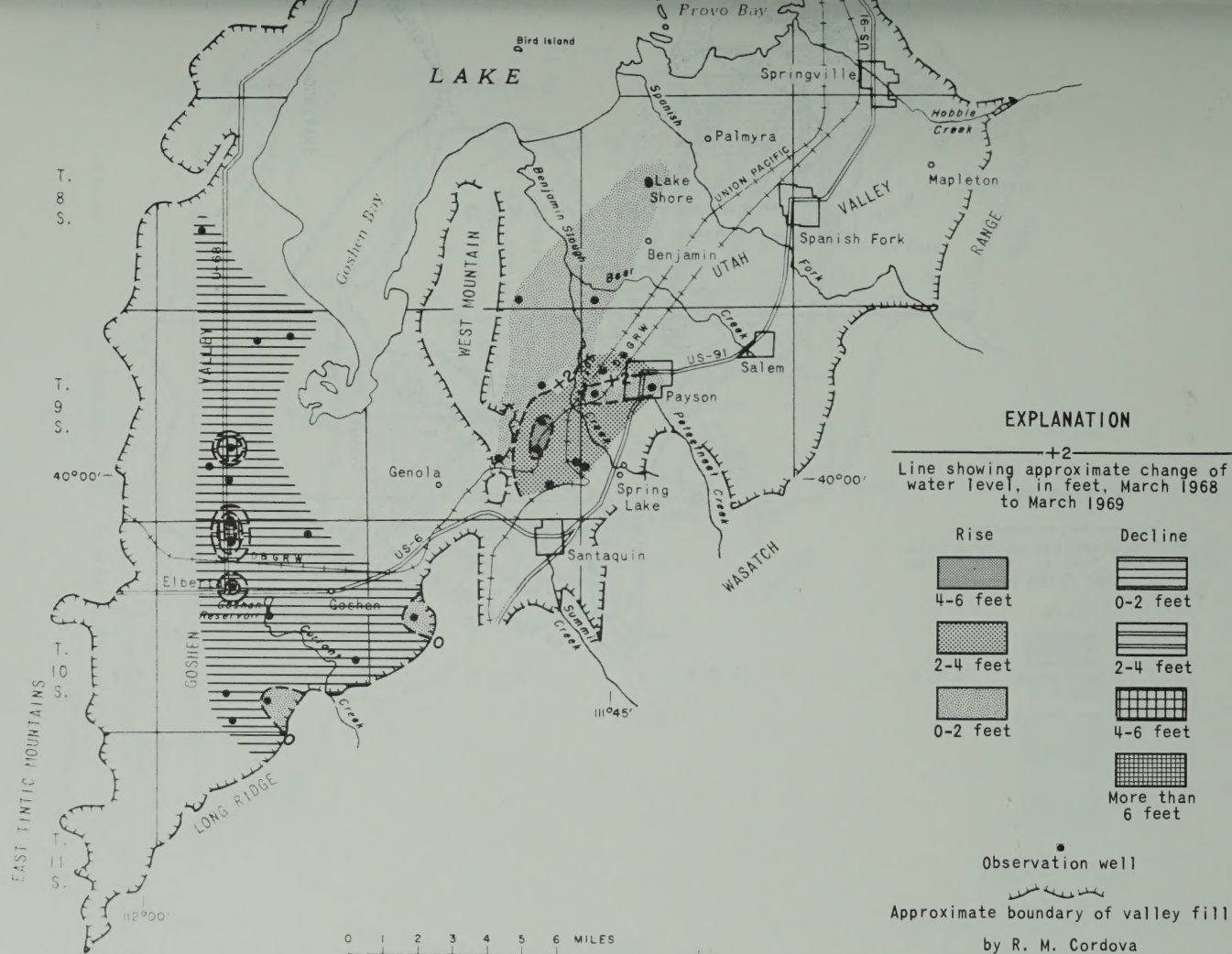


Figure 11.—Map of Utah and Goshen Valleys showing change of water levels in the water-table aquifers from March 1968 to March 1969.



Figure 12.—Map of Utah and Goshen Valleys showing change of water levels in the shallow artesian aquifer in rocks of Pleistocene age from March 1968 to March 1969.

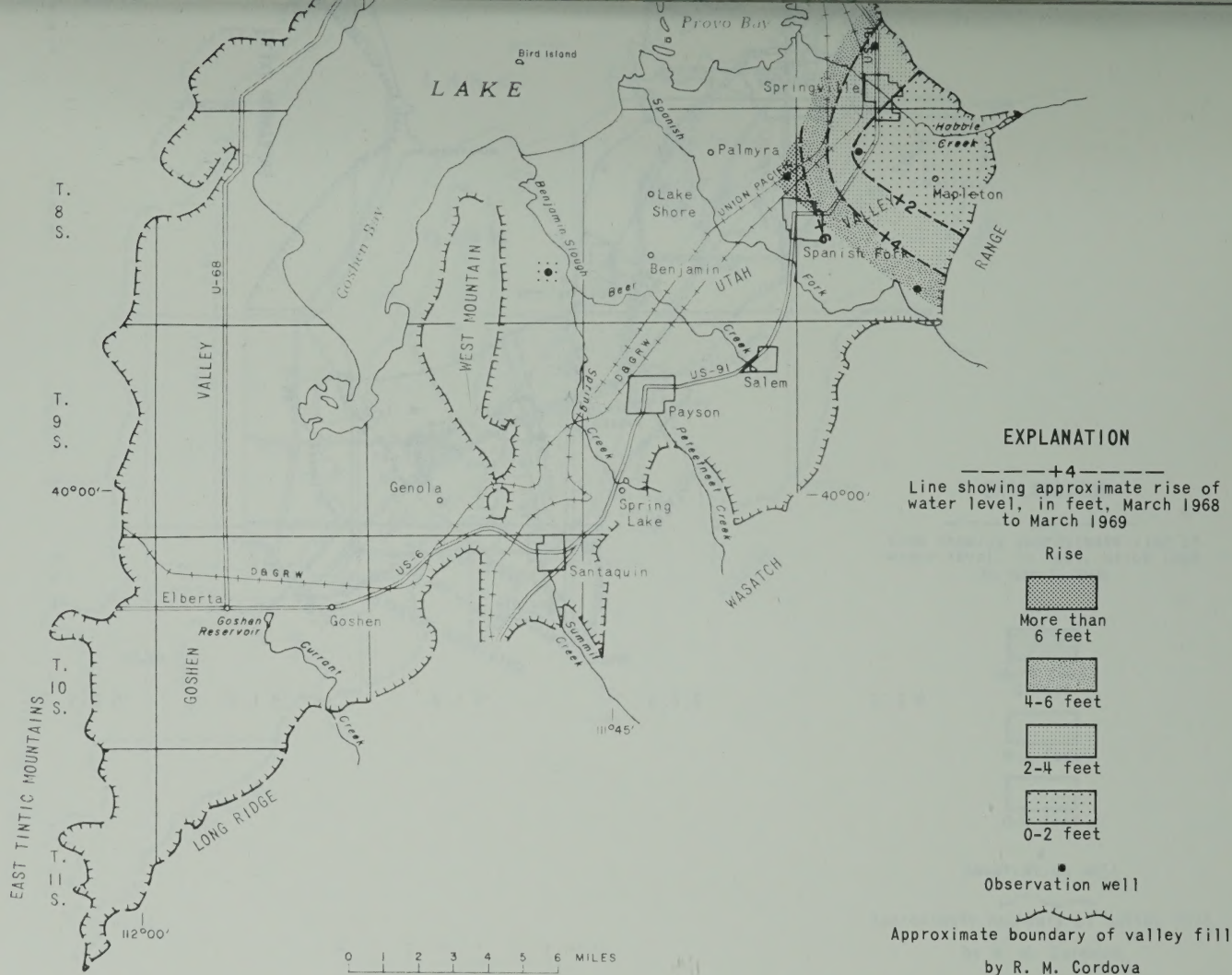
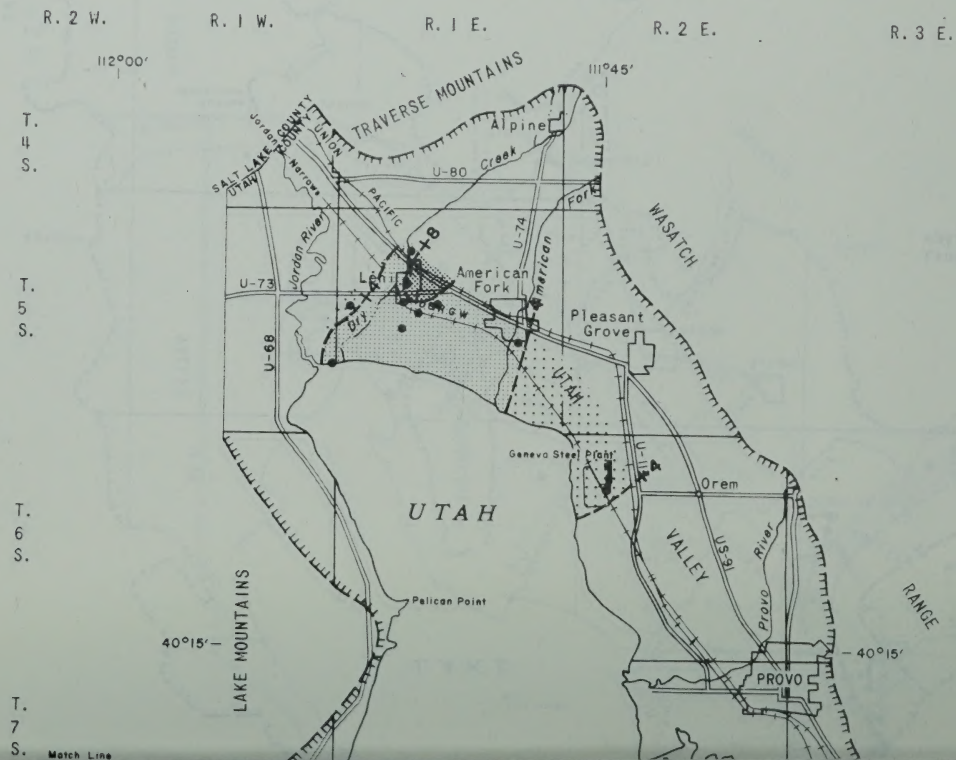


Figure 13.—Map of Utah and Goshen Valleys showing change of water levels in the deep artesian aquifer in rocks of Pleistocene age from March 1968 to March 1969.



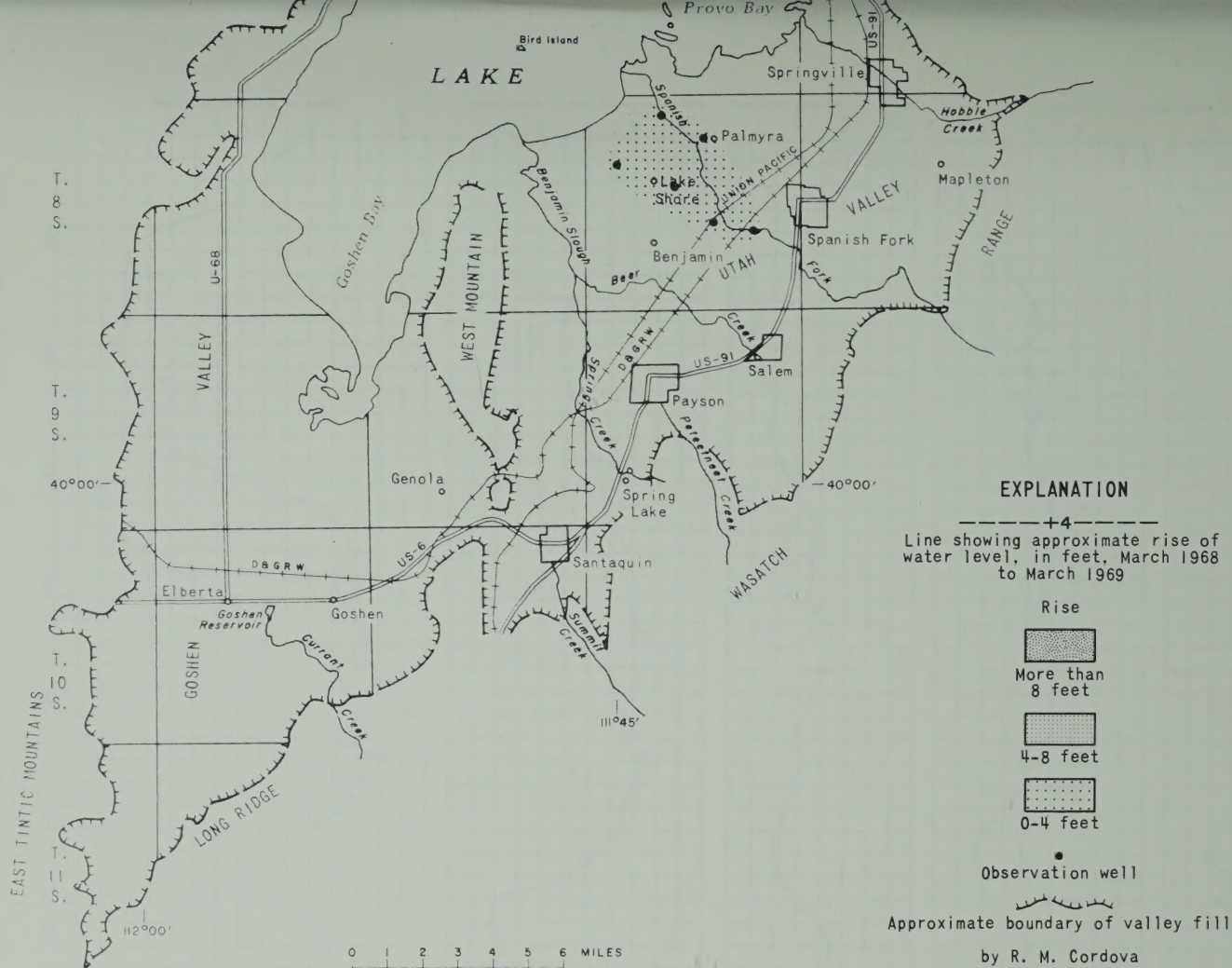


Figure 14.—Map of Utah and Goshen Valleys showing change in water levels in the artesian aquifer in rocks of Tertiary age from March 1968 to March 1969.

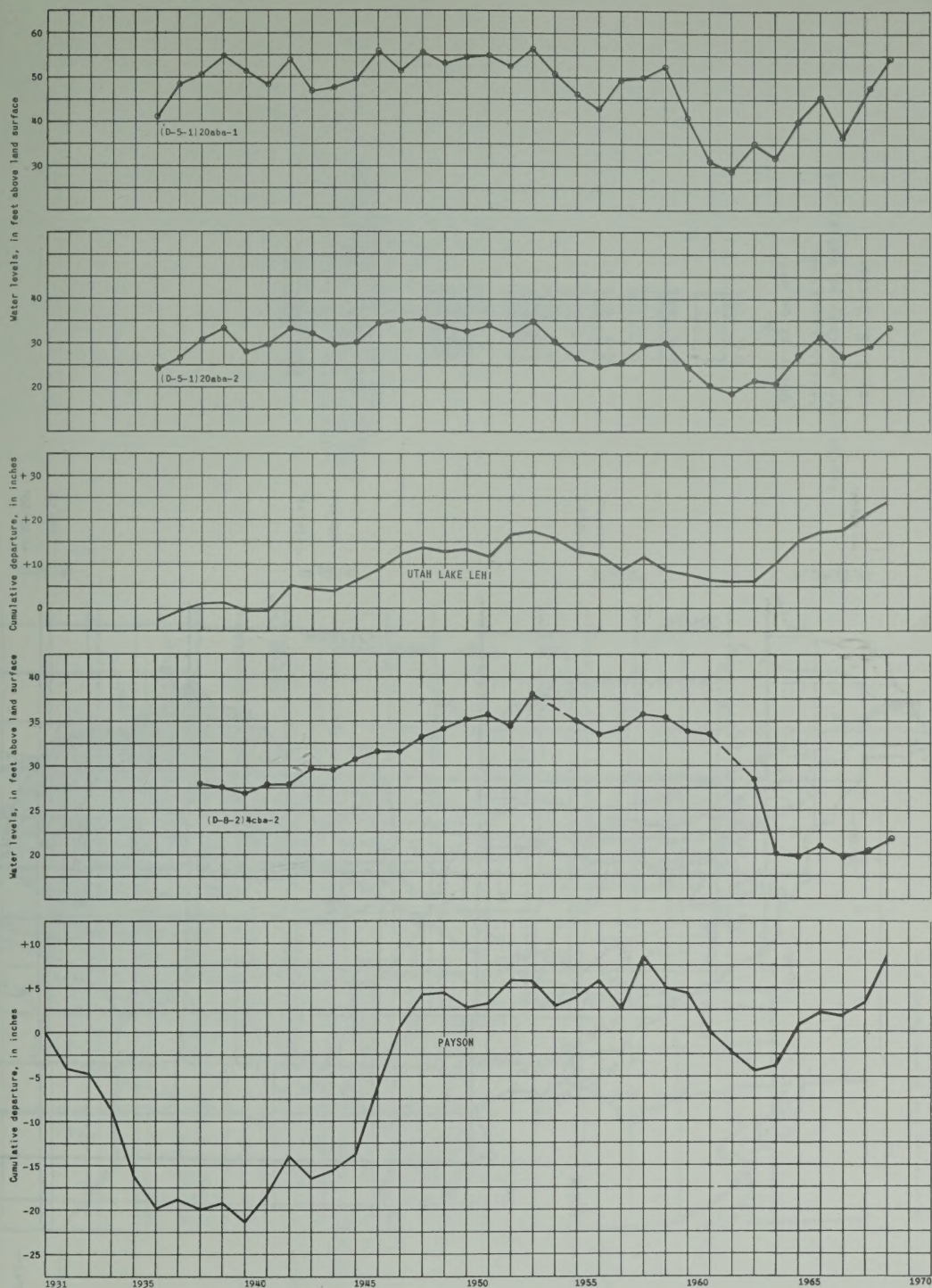
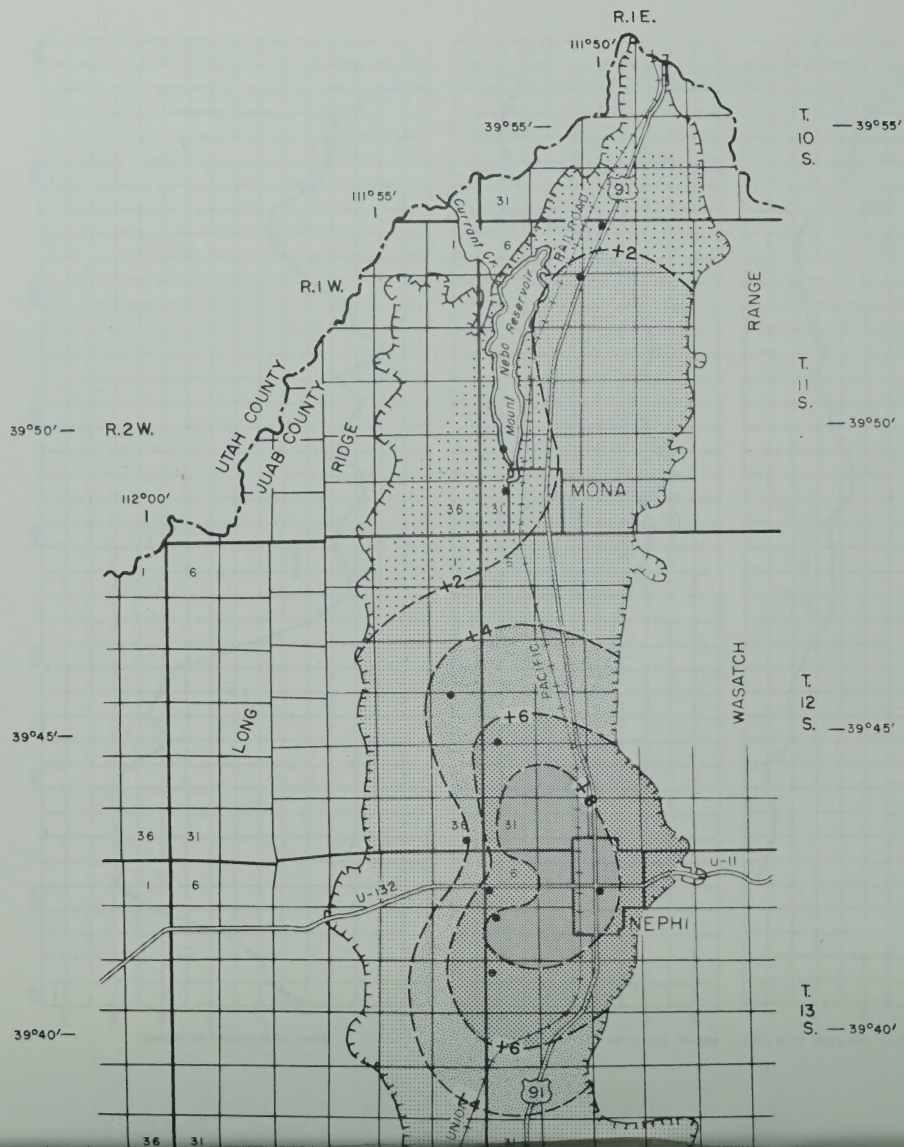


Figure 15.—Relation of water levels in selected observation wells in Utah Valley to cumulative departure from the 1931-60 normal annual precipitation at Utah Lake Lehi and Payson.



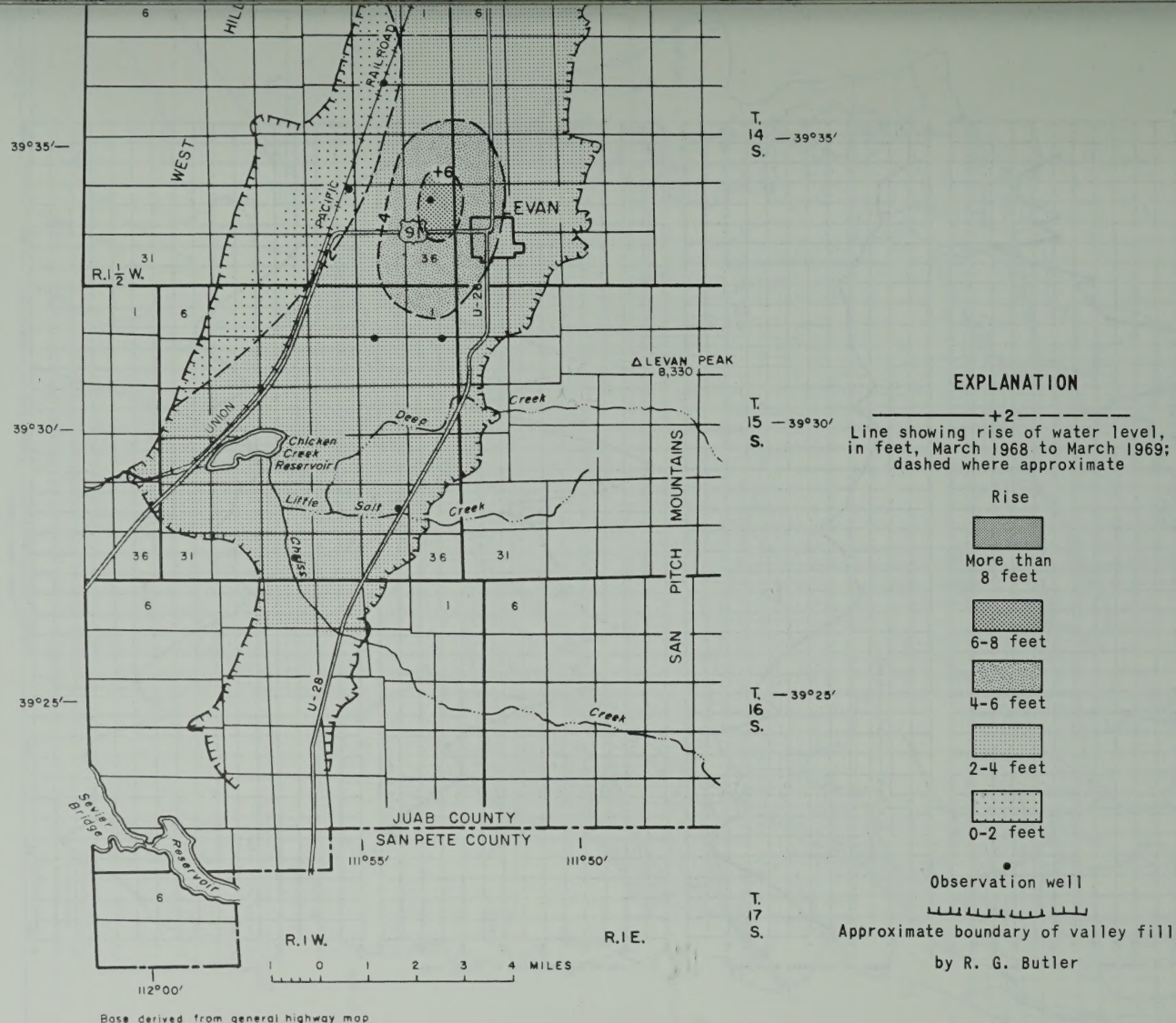


Figure 16.—Map of Juab Valley showing change of water levels from March 1968 to March 1969.

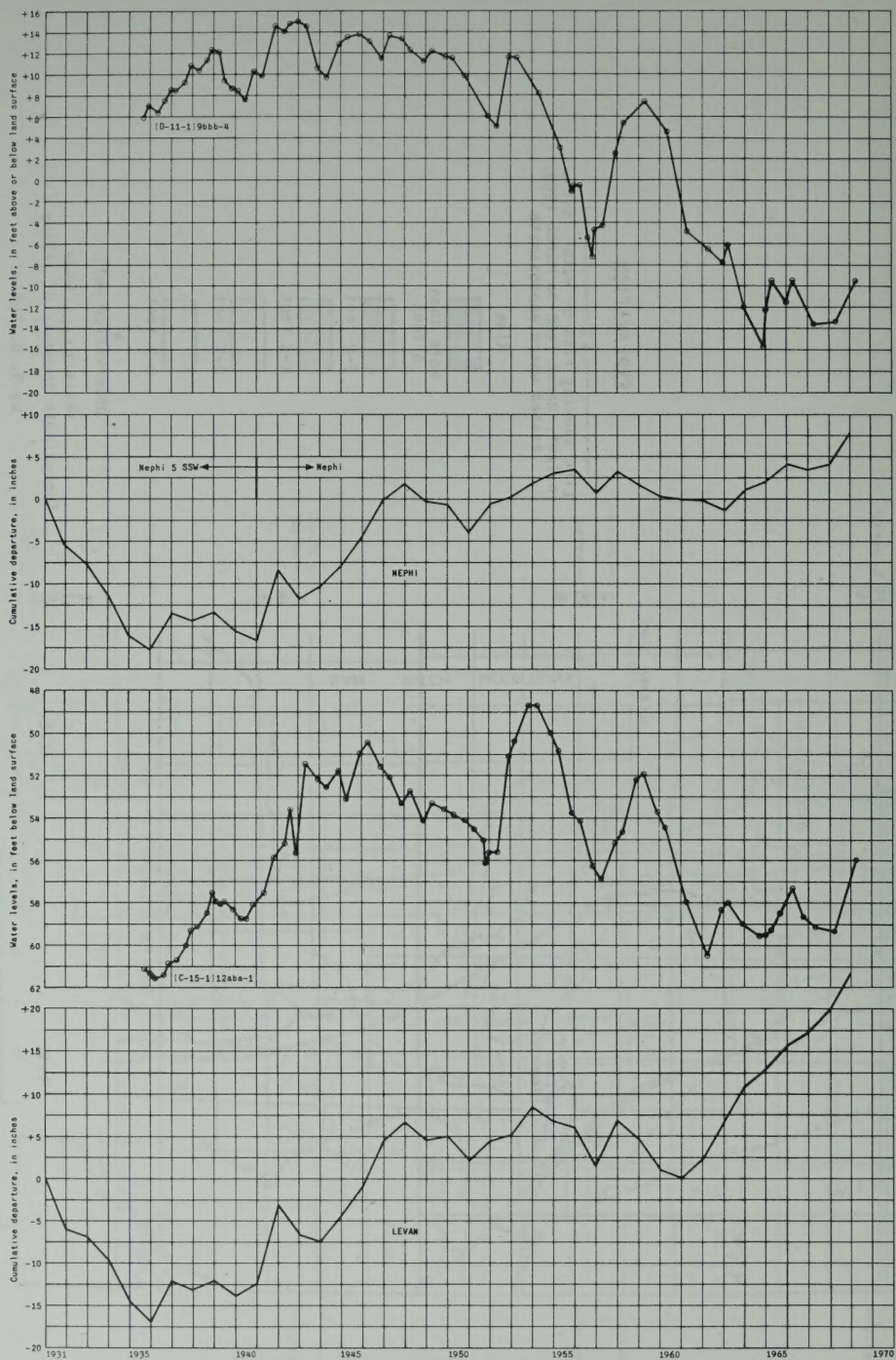


Figure 17.—Relation of water levels in wells (D-11-1)9bbb-4 and (C-15-1)12aba-1 to cumulative departure from the 1931-60 normal annual precipitation at Nephi and Levan.

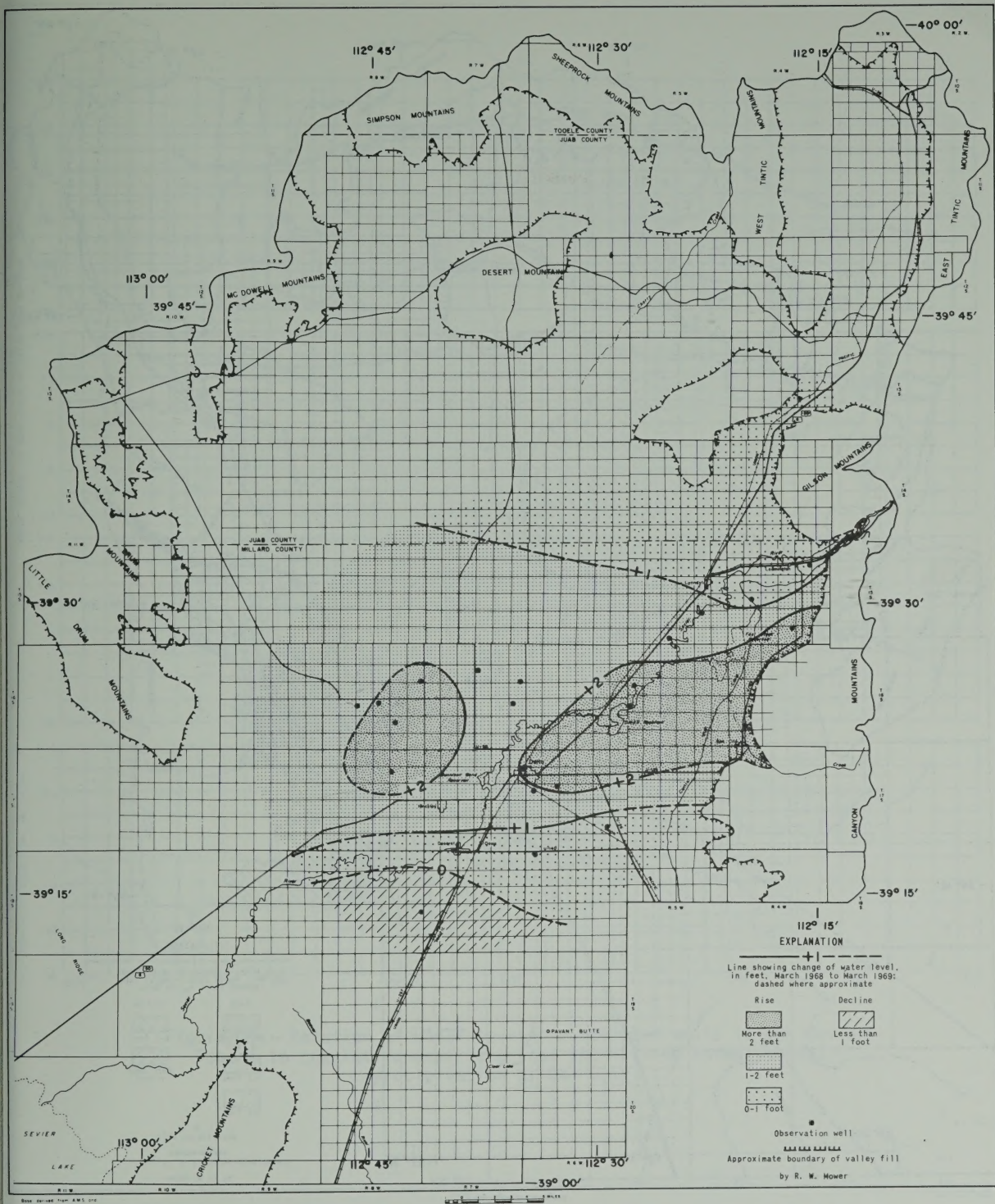


Figure 18.—Map of part of the Sevier Desert showing change of water levels in the lower artesian aquifer from March 1968 to March 1969.

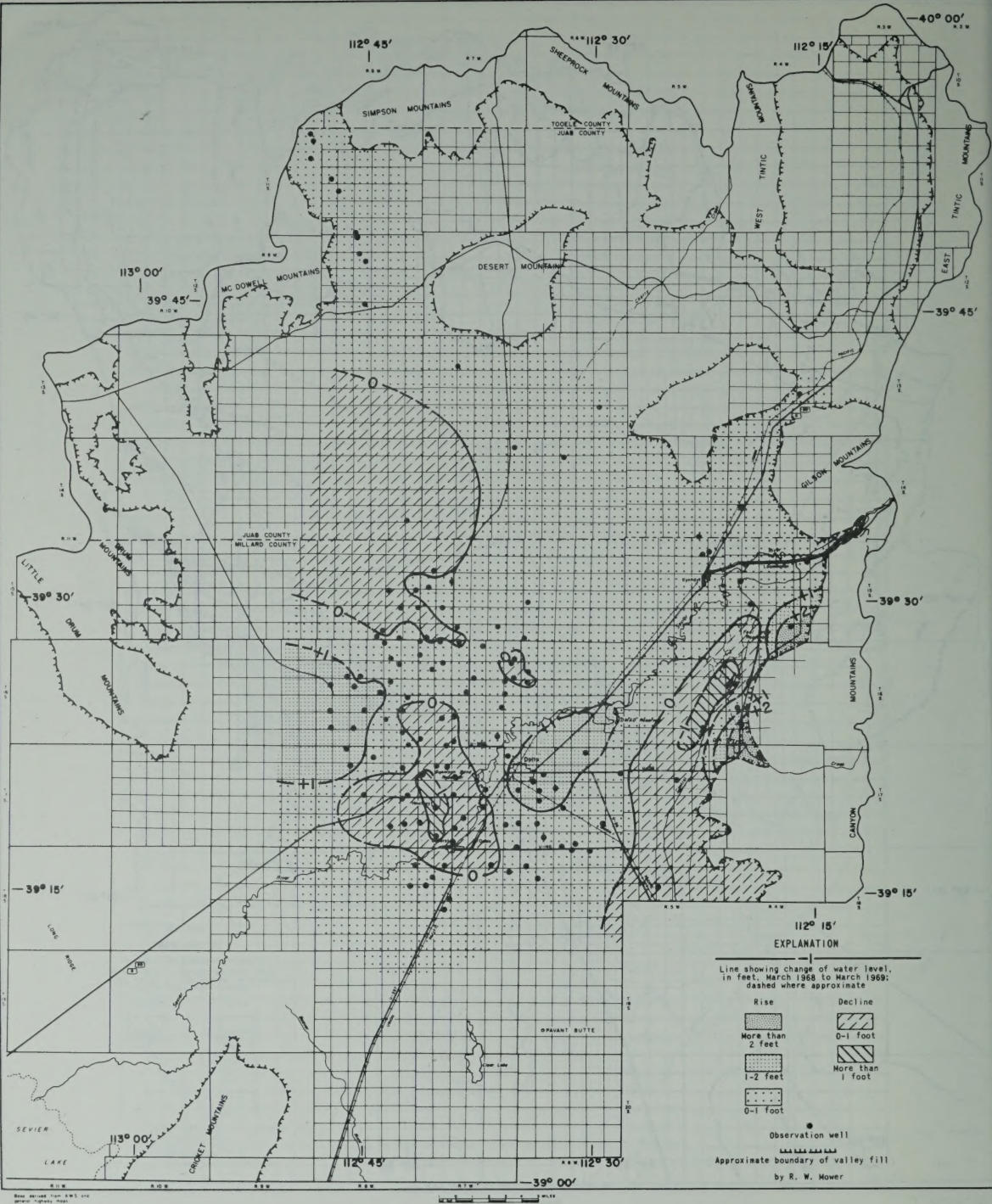


Figure 19.—Map of part of the Sevier Desert showing change of water levels in the upper artesian aquifer from March 1968 to March 1969.

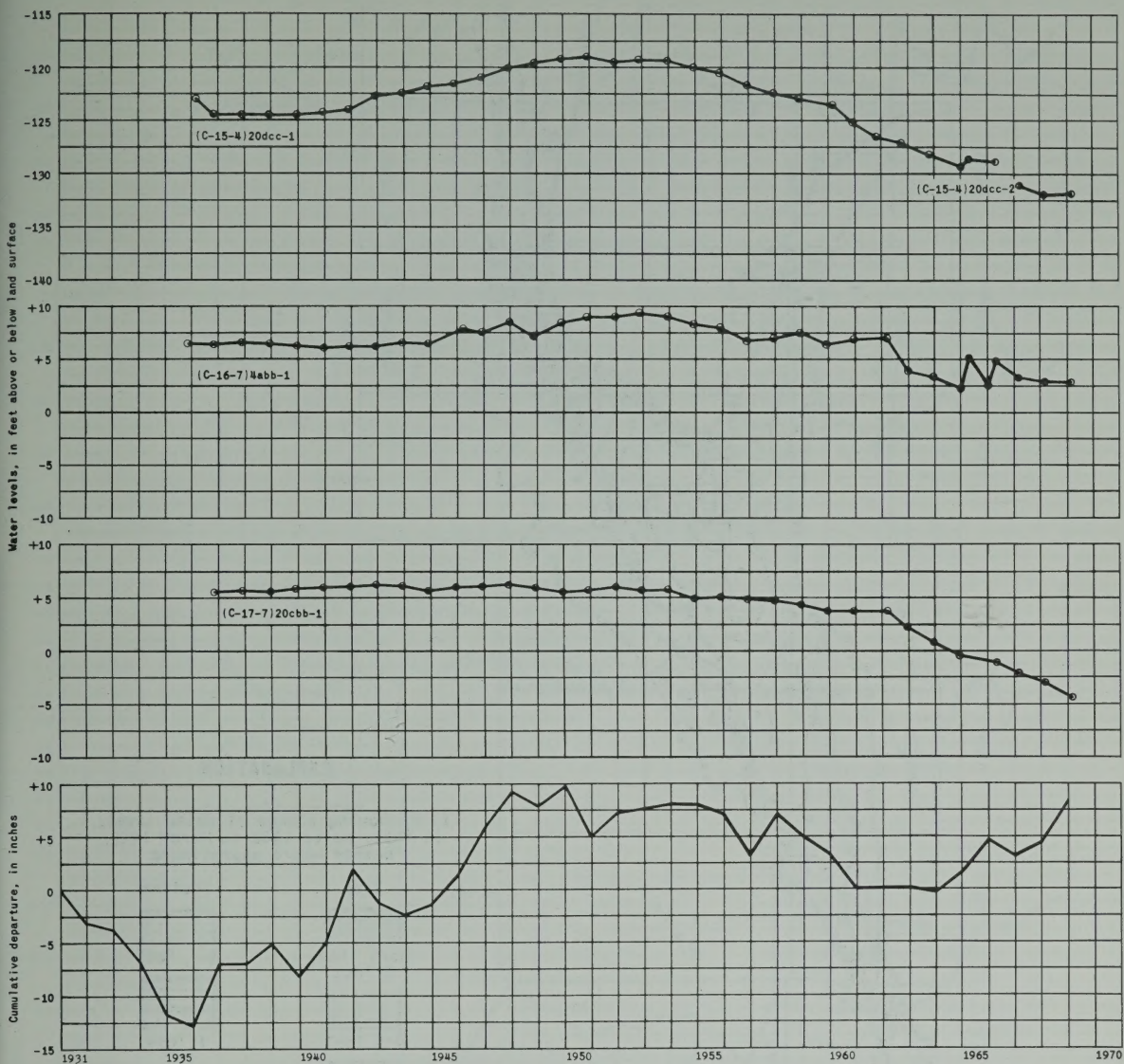


Figure 20.—Relation of water levels in selected wells in the Sevier Desert to cumulative departure from the 1931-60 normal annual precipitation at Oak City.

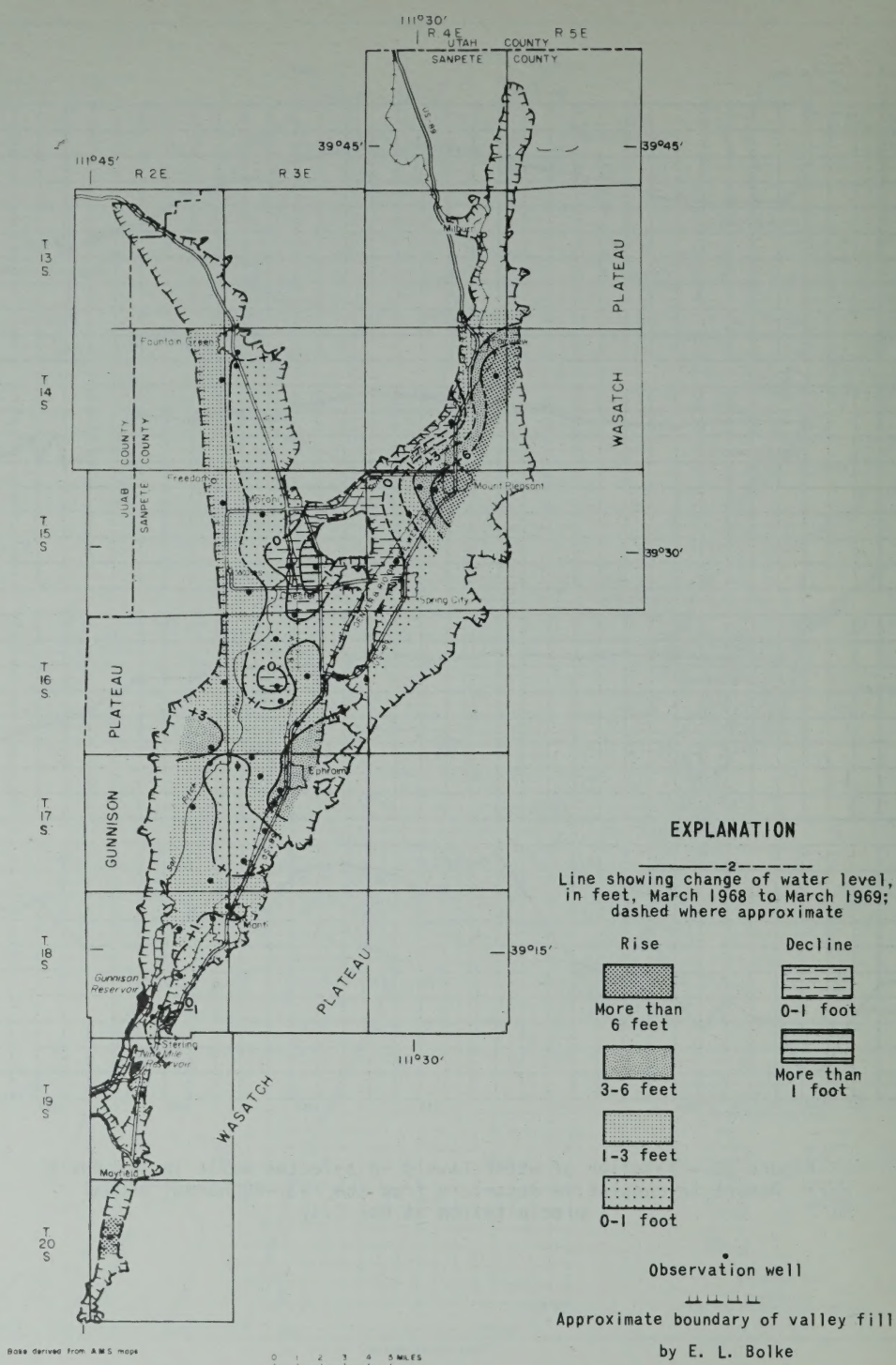


Figure 21.—Map of Sanpete Valley showing change of water levels from March 1968 to March 1969.

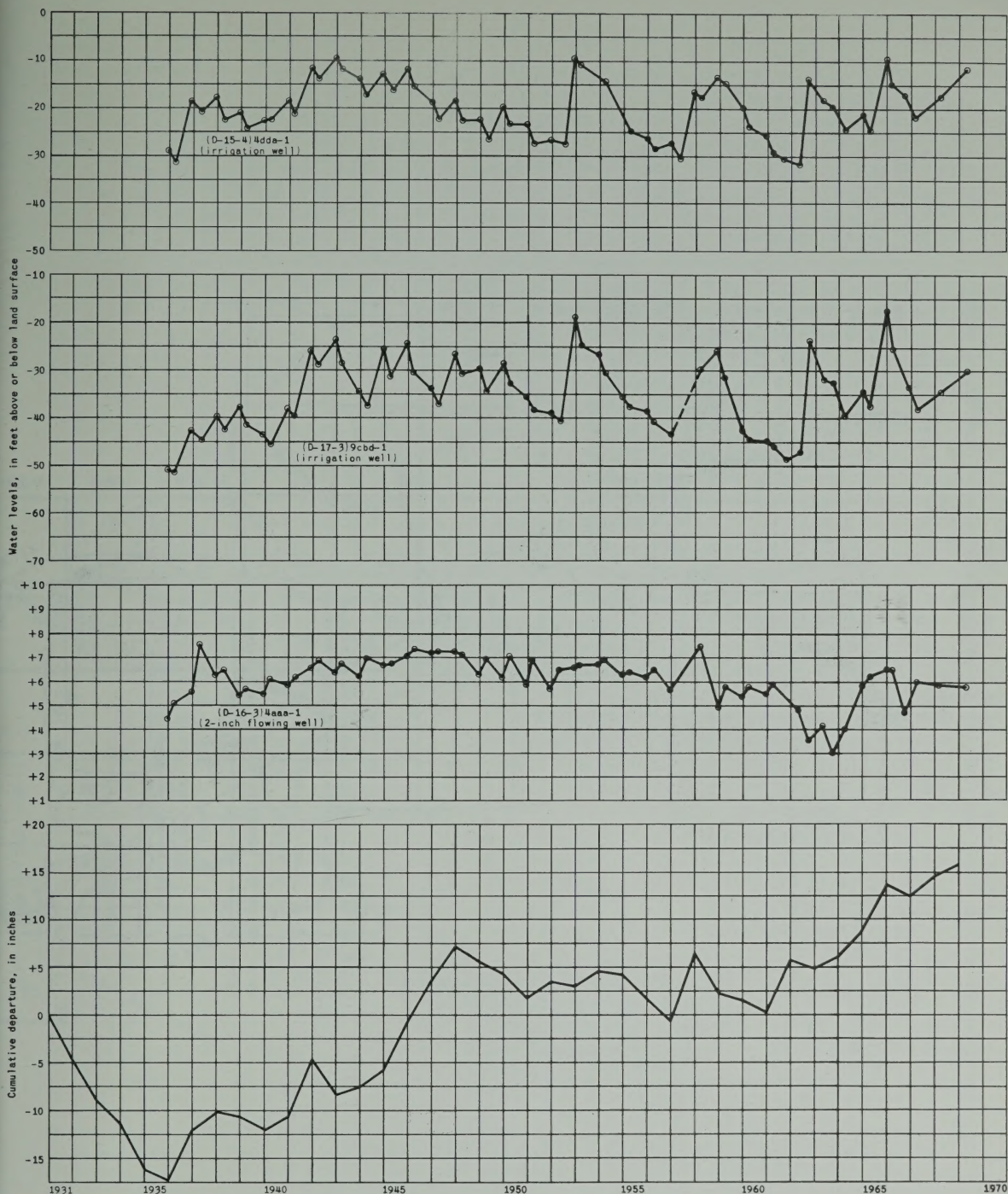
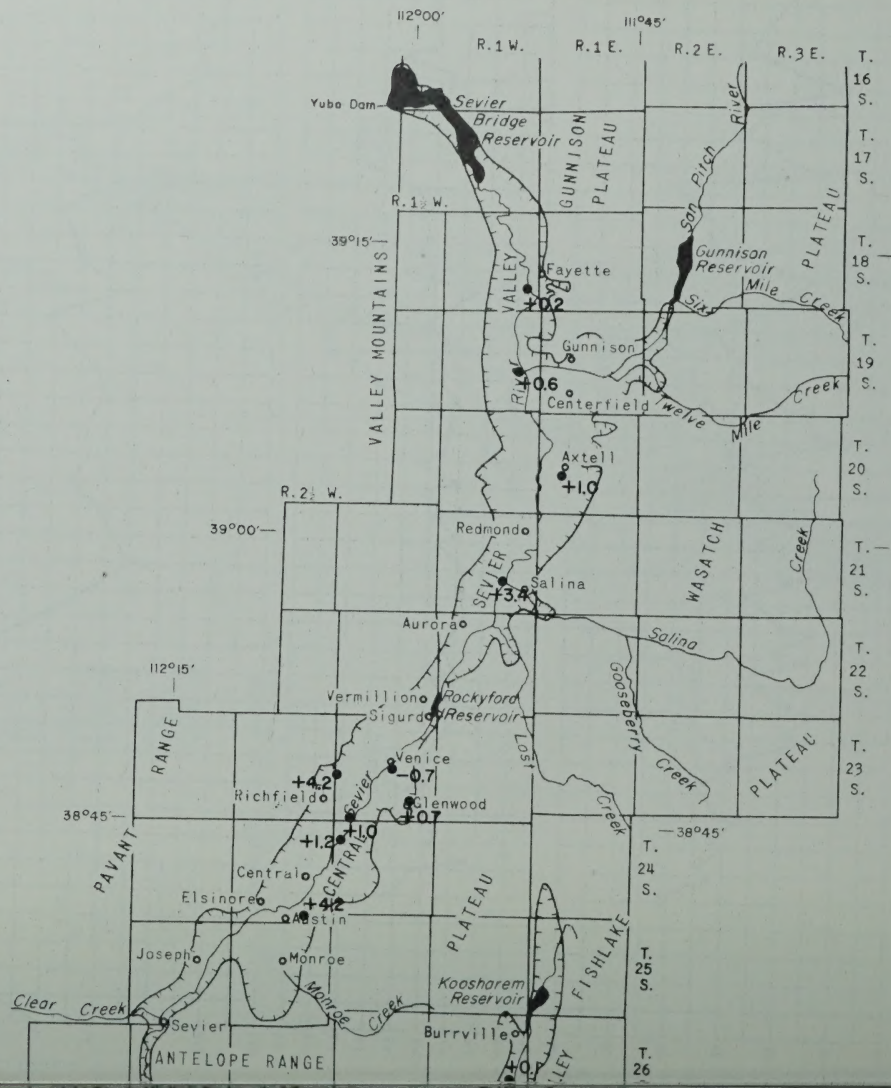


Figure 22.—Relation of water levels in three wells in Sanpete Valley to cumulative departure from the 1931-60 normal annual precipitation at Manti.



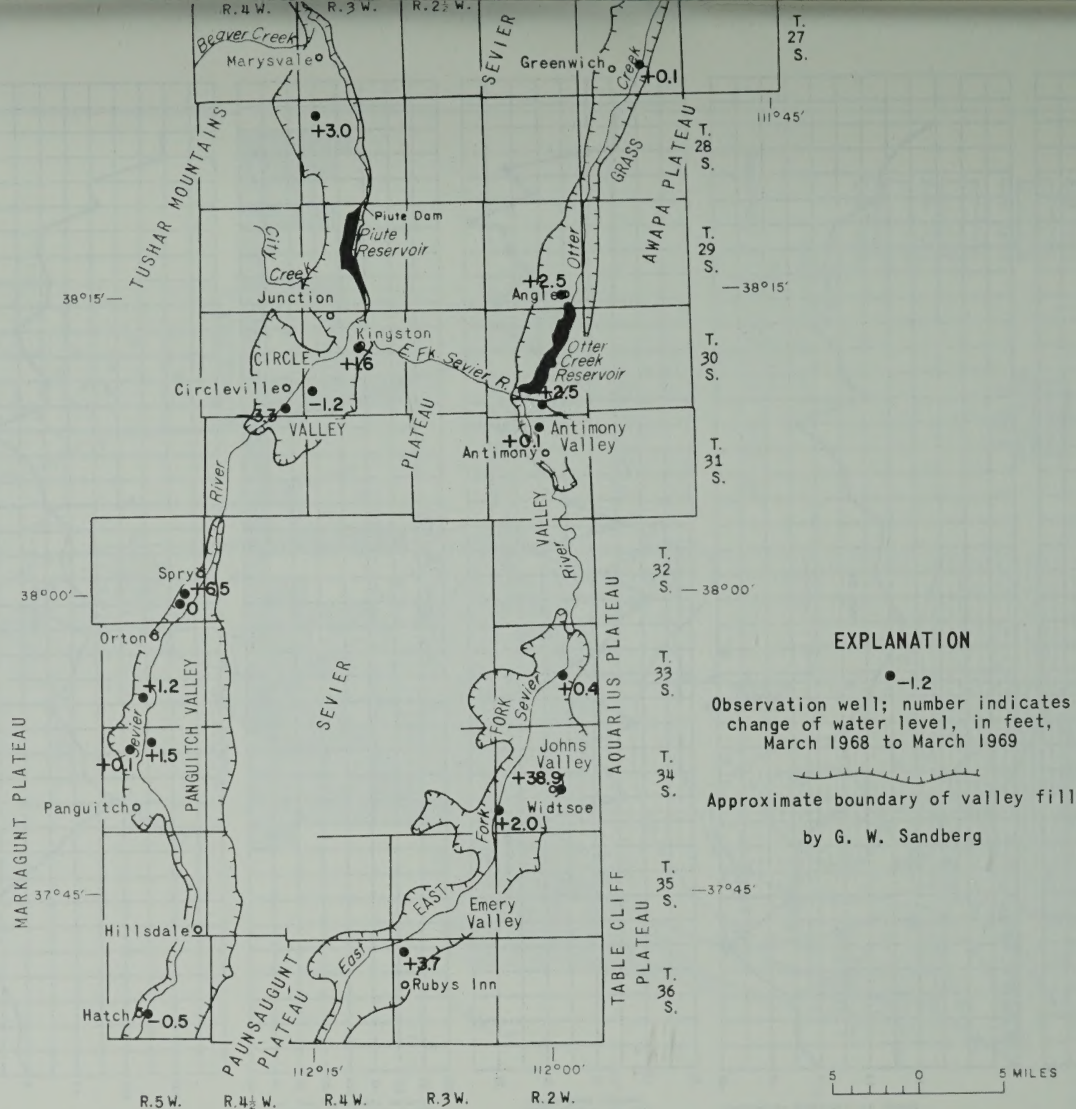


Figure 23.—Map of the upper and central Sevier Valleys showing change of water levels from March 1968 to March 1969.

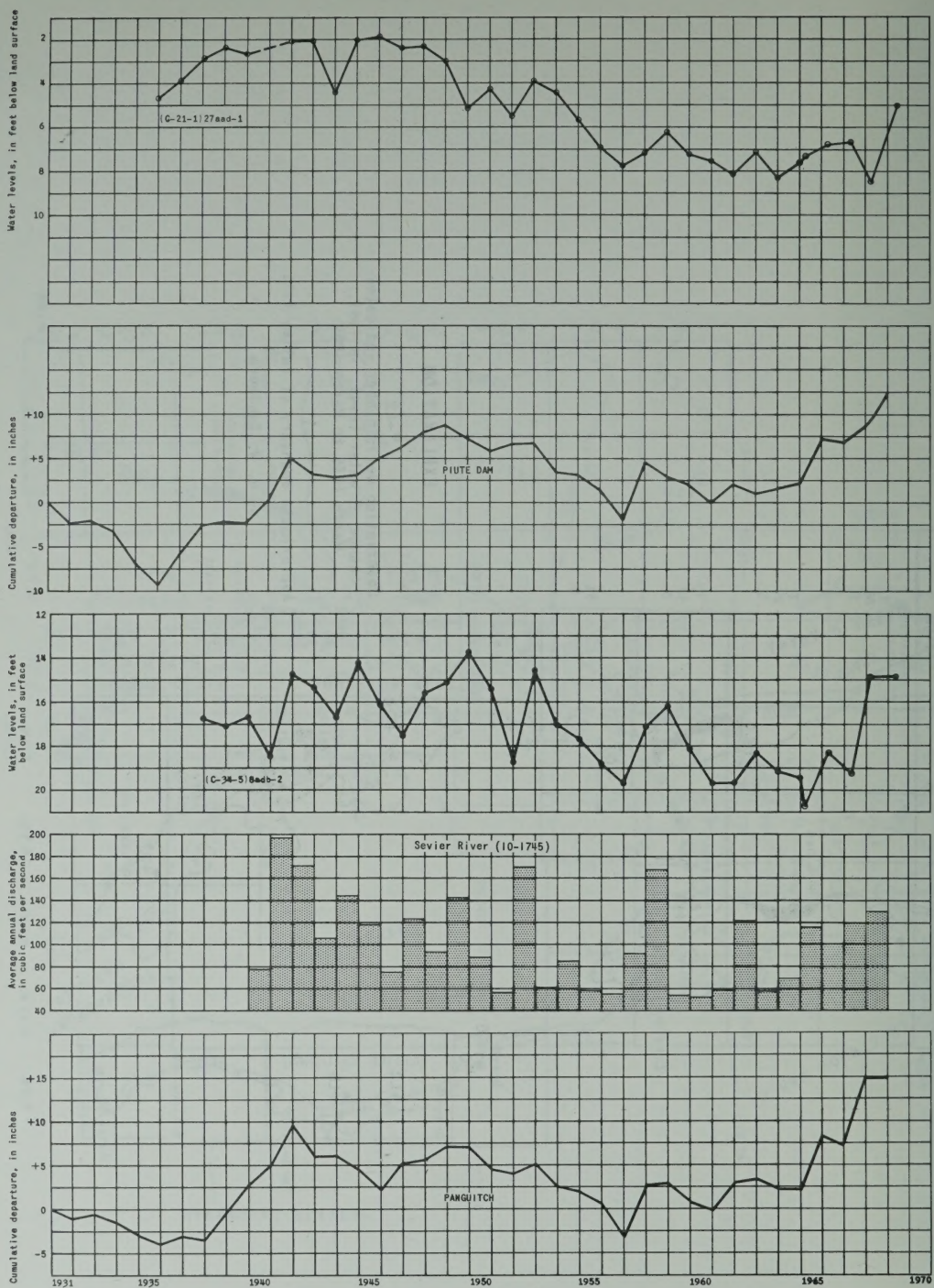


Figure 24.—Relation of water levels in selected observation wells and of average annual discharge of the Sevier River at Hatch to cumulative departure from the 1931-60 normal annual precipitation at Piute Dam and Panguitch.

EXPLANATION

—+2—+2—+2—
Line showing change of water level,
in feet, March 1968 to March 1969;
dashed where approximate

Rise

More than
8 feet

6-8 feet

4-6 feet

2-4 feet

0-2 feet

Decline

0-1 foot

1-2 feet

More than
2 feet

Observation well

Boundary of ground-water district
by R. W. Mower

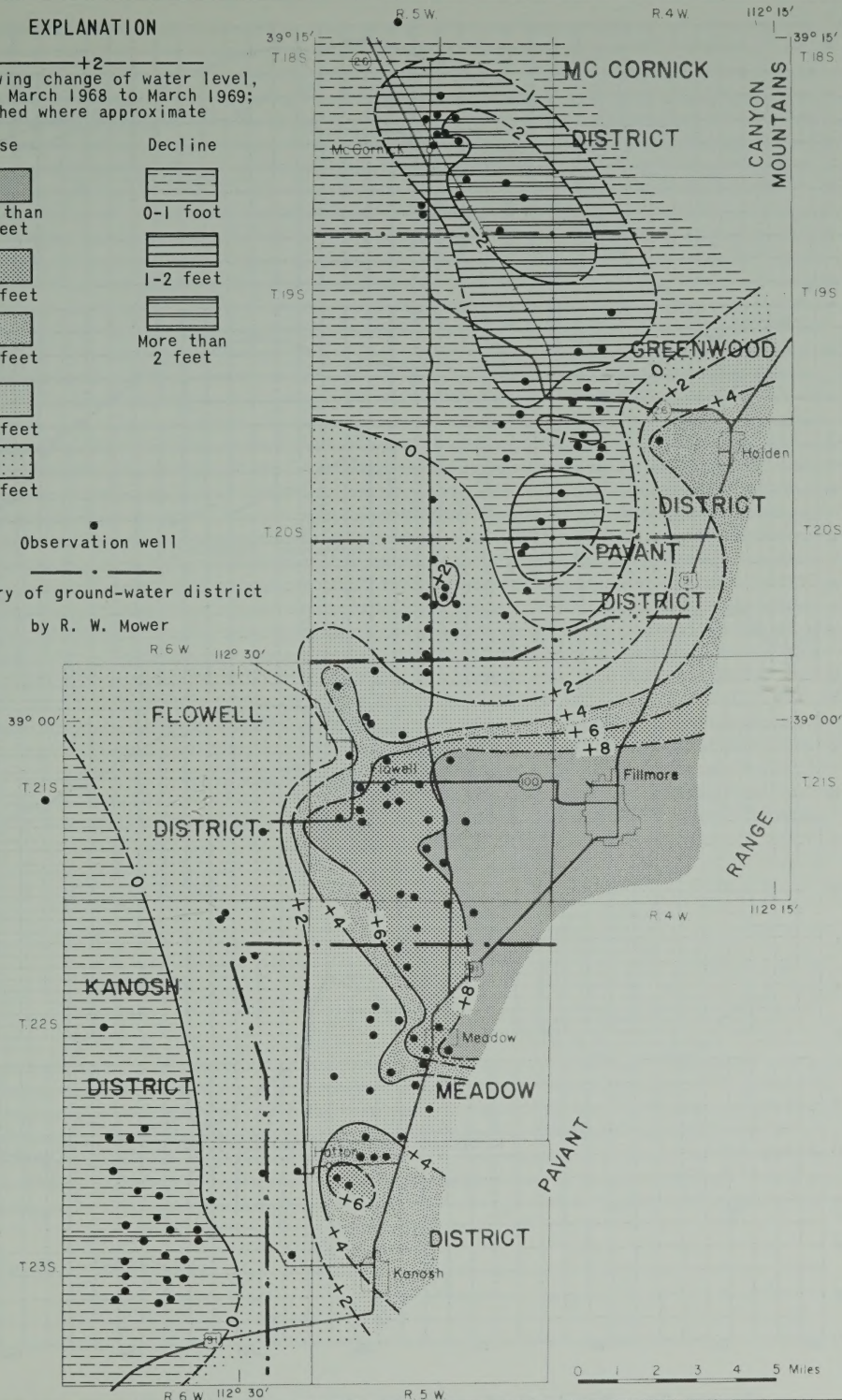


Figure 25.—Map of the Pavant Valley showing change of water levels from March 1968 to March 1969.

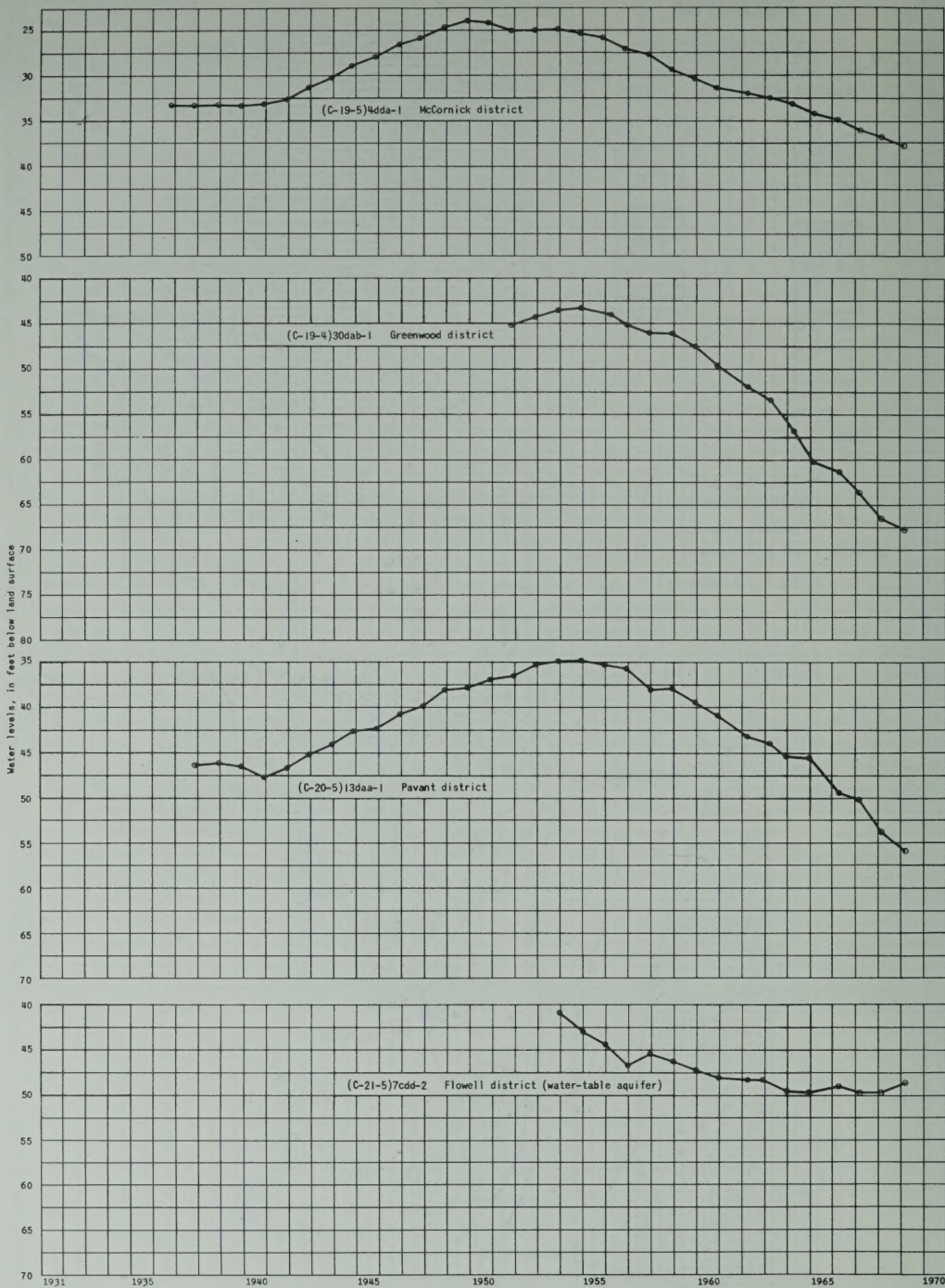


Figure 26.—Relation of water levels in selected wells in Pavant Valley to cumulative departure from the 1931-60 normal annual precipitation at Fillmore.

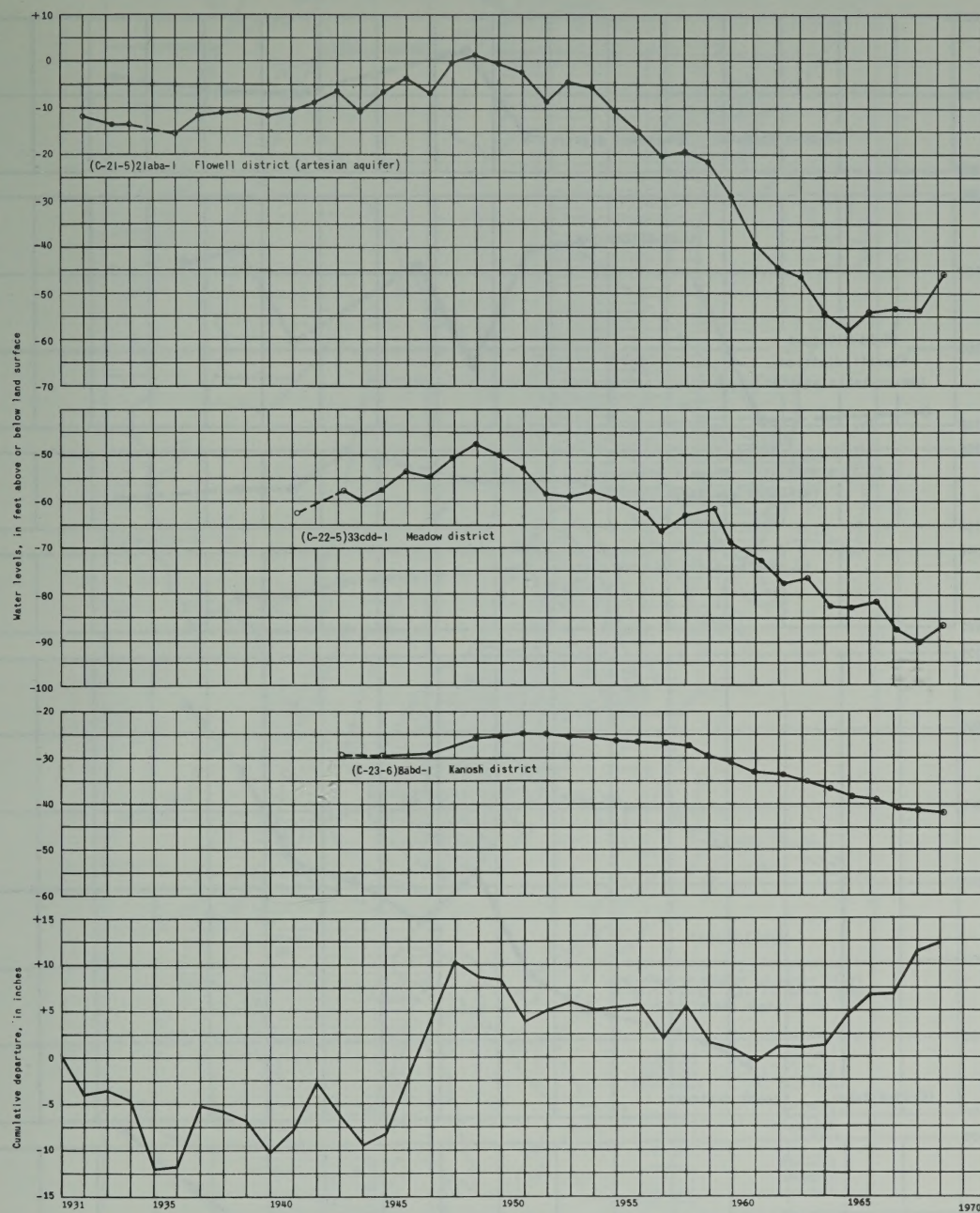


Figure 26.—Continued.

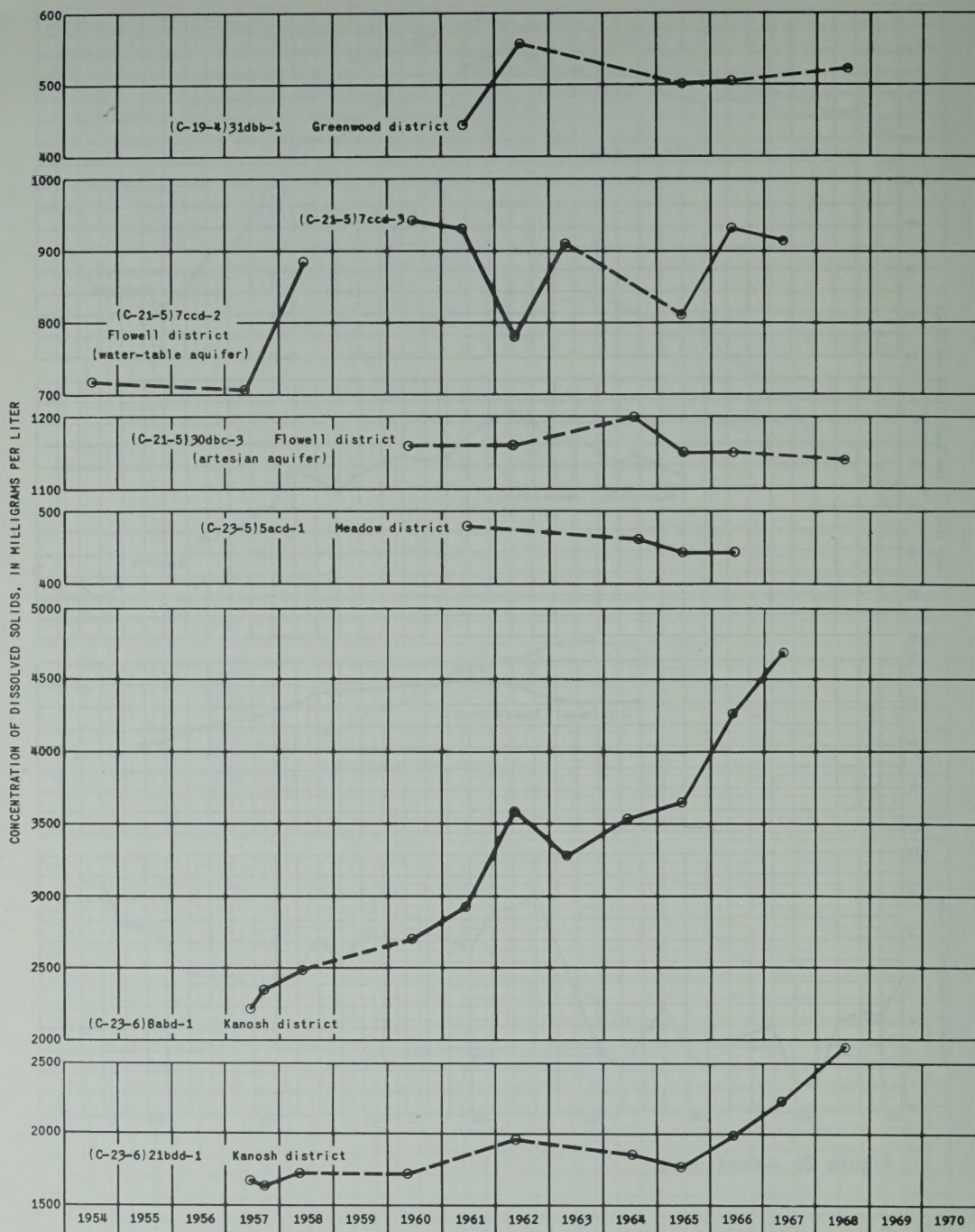


Figure 27.—Concentration of dissolved solids in water from selected wells in Pavant Valley. (Concentrations calculated from determined constituents, except those for 1962 which were calculated from residue on evaporation at 180°C).

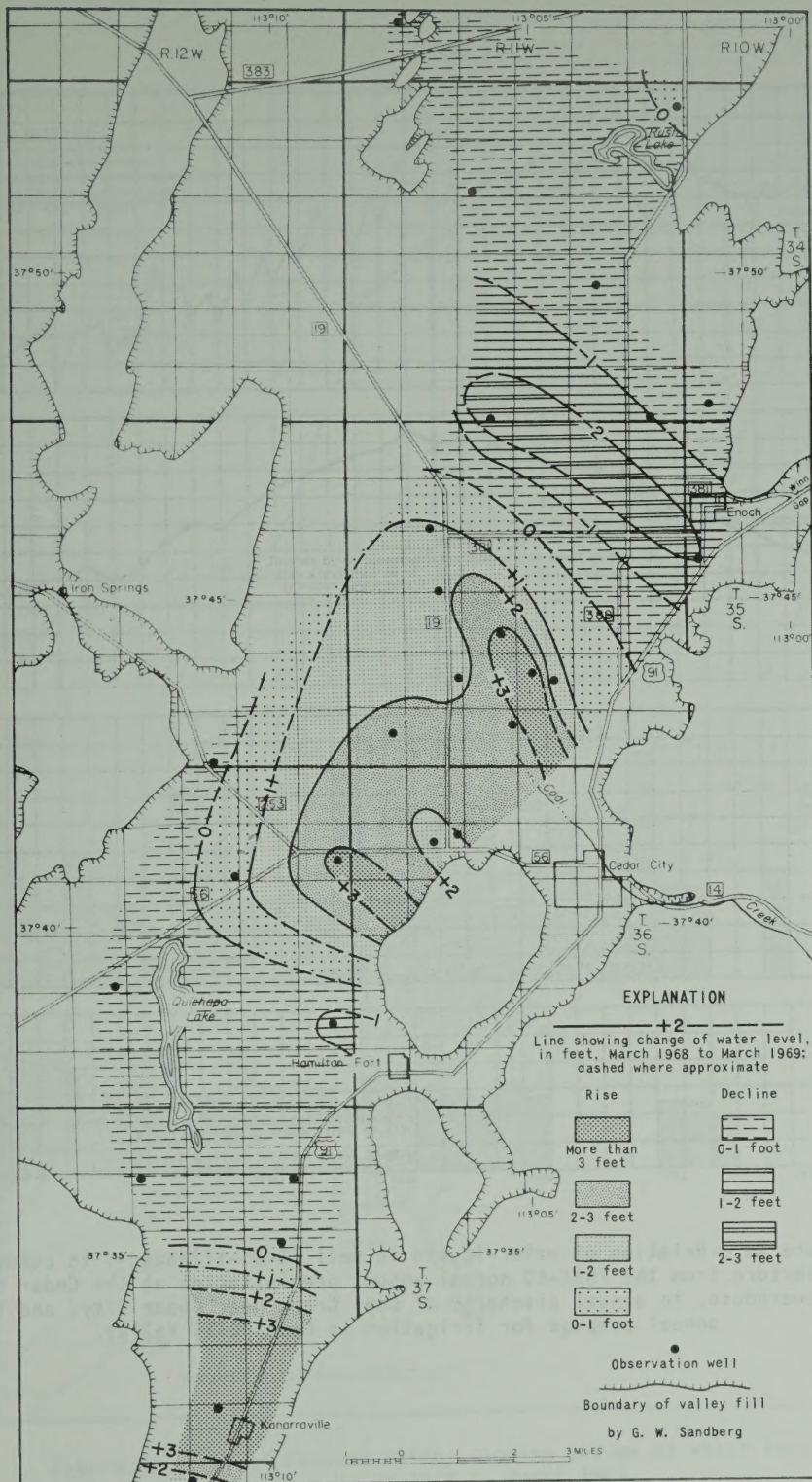


Figure 28.—Map of Cedar City Valley showing change of water levels from March 1968 to March 1969.

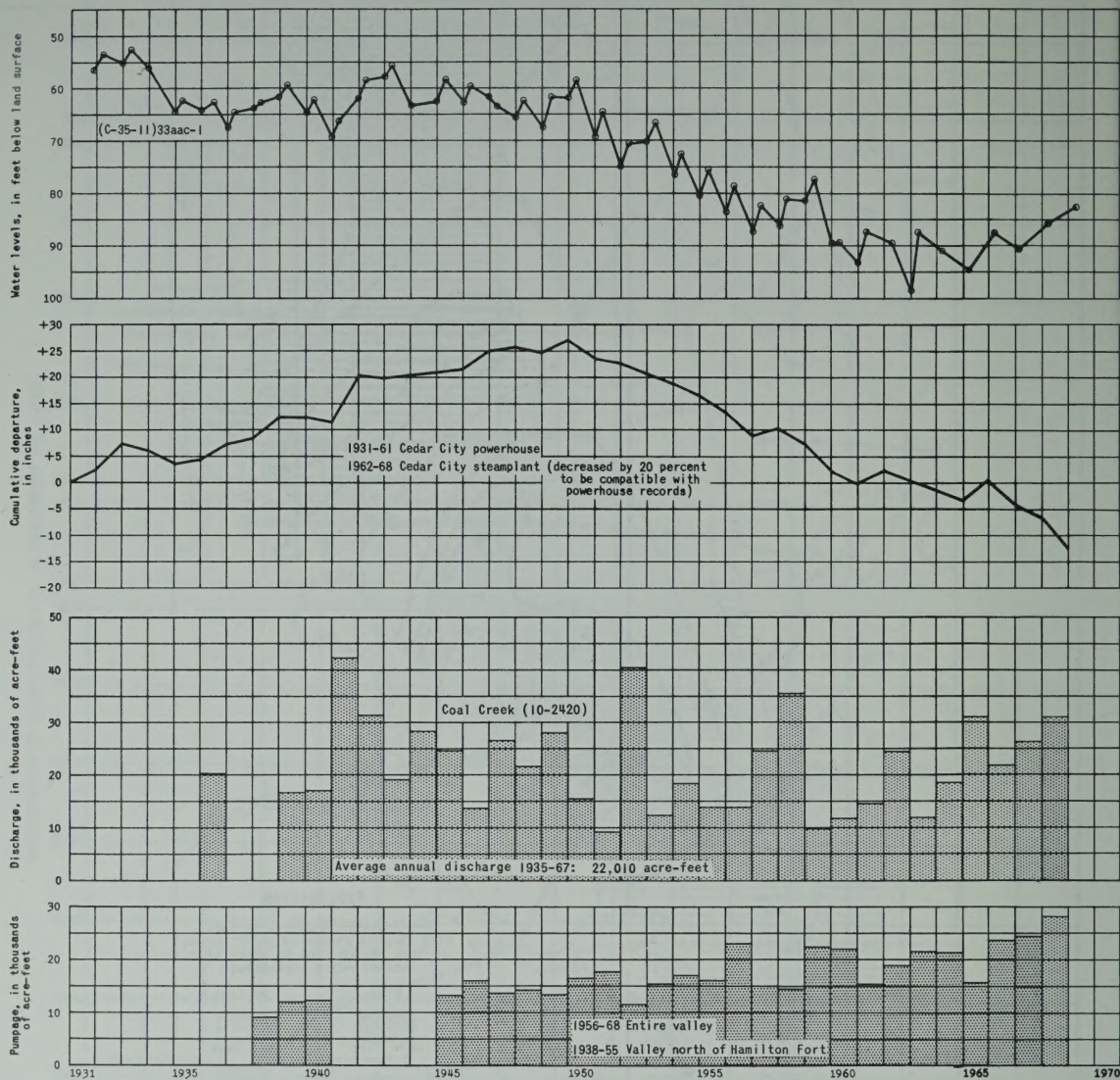


Figure 29.—Relation of water levels in well (C-35-11)33aac-1 to cumulative departure from the 1931-60 normal annual precipitation at the Cedar City powerhouse, to annual discharge of Coal Creek near Cedar City, and to annual pumpage for irrigation in Cedar City Valley.

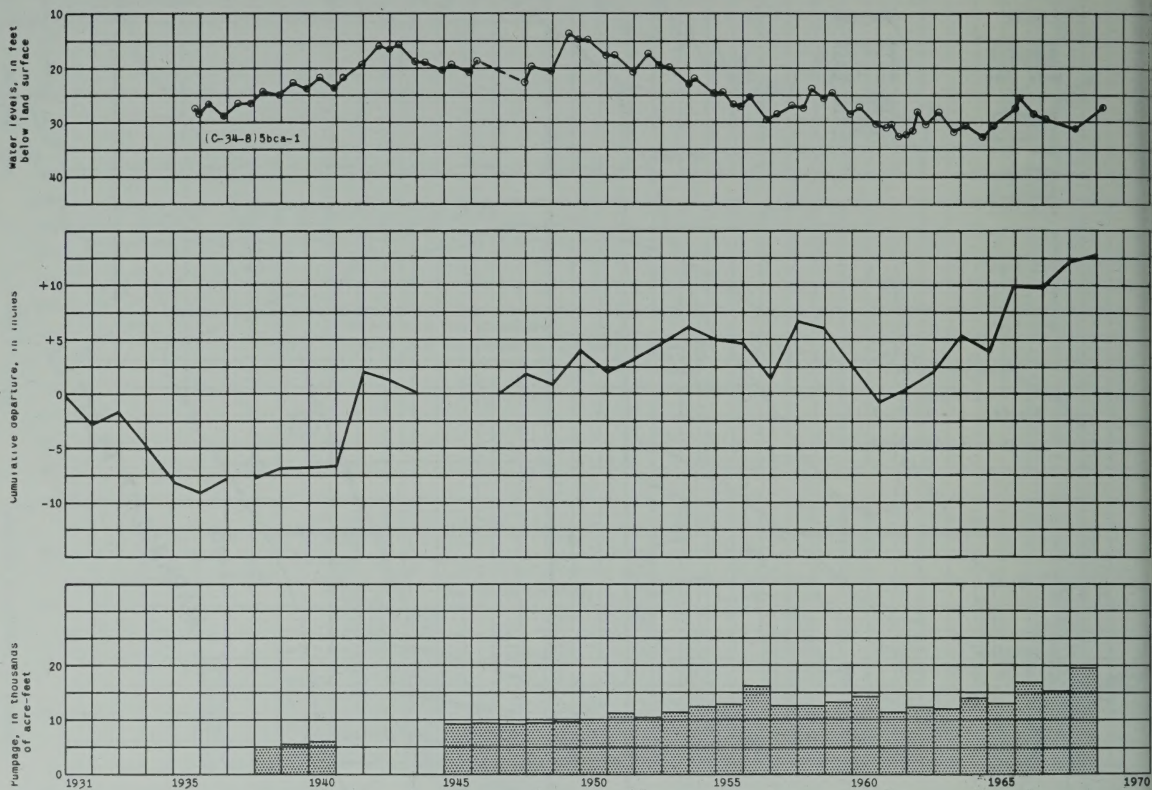


Figure 31.—Relation of water levels in well (C-34-8)5bca-1 to cumulative departure from the 1931-60 normal annual precipitation at Parowan and to pumpage for irrigation in Parowan Valley.

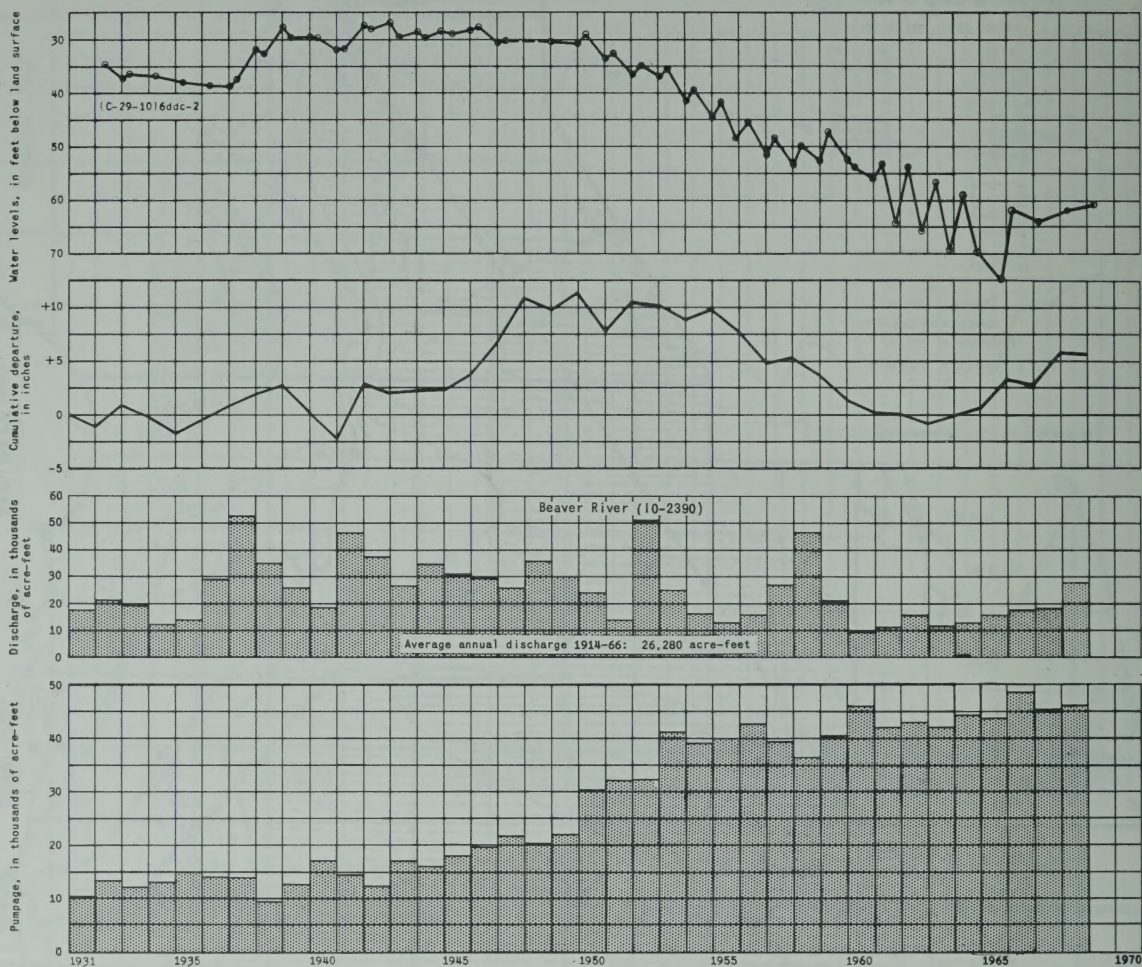


Figure 33.—Relation of water levels in well (C-29-10)6ddc-2 to cumulative departure from the 1931-60 normal annual precipitation at Milford airport, to discharge of Beaver River at Rockyford Dam near Minersville, and to pumpage for irrigation in the Milford district, Escalante Valley.

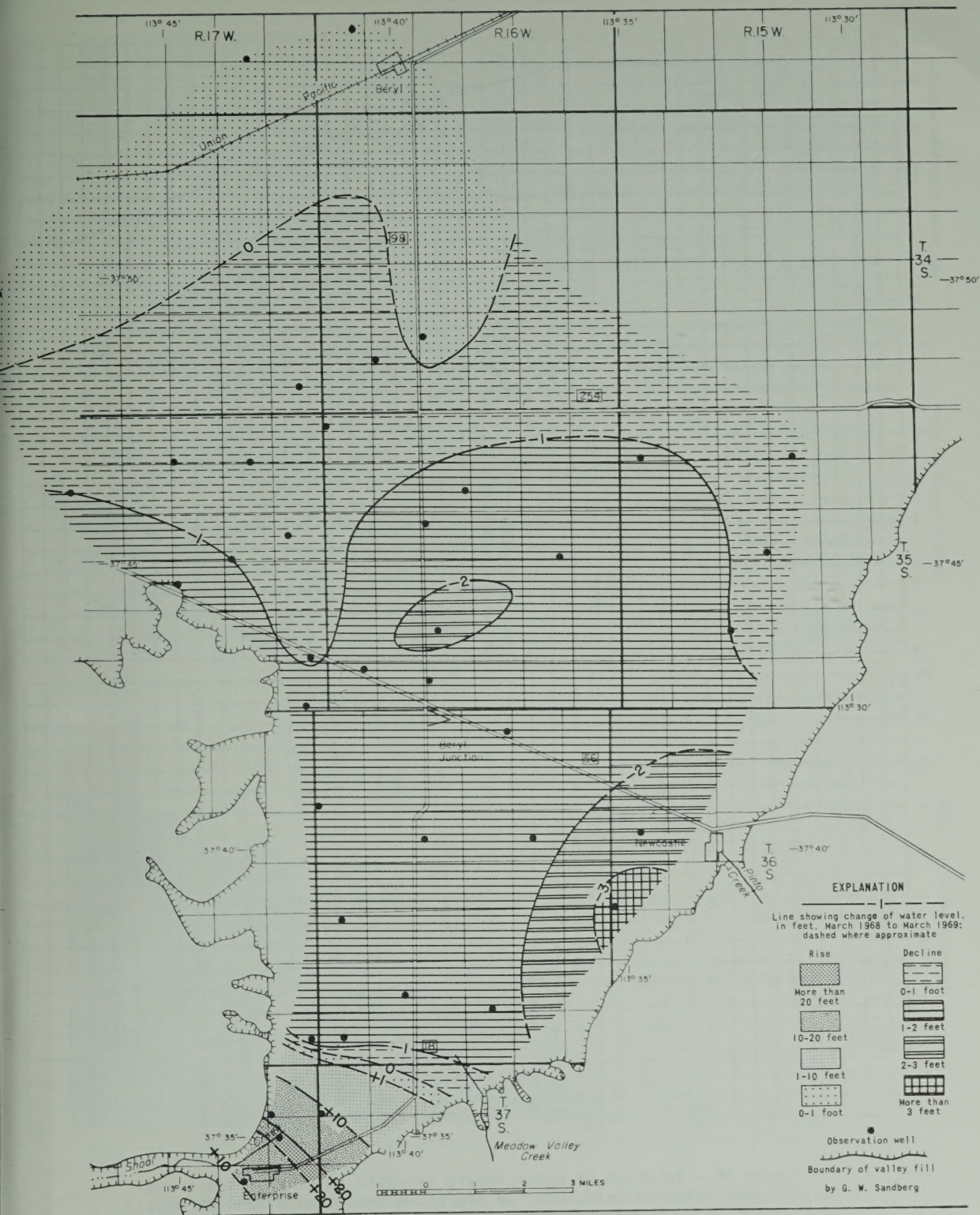


Figure 34.—Map of the Beryl-Enterprise district, Escalante Valley, showing change of water levels from March 1968 to March 1969.

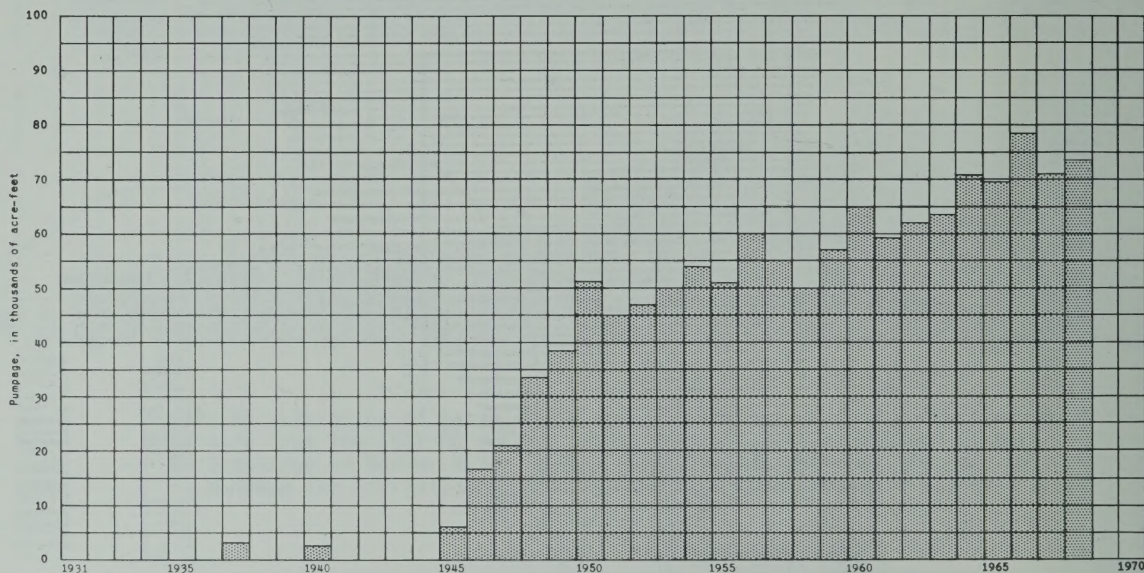
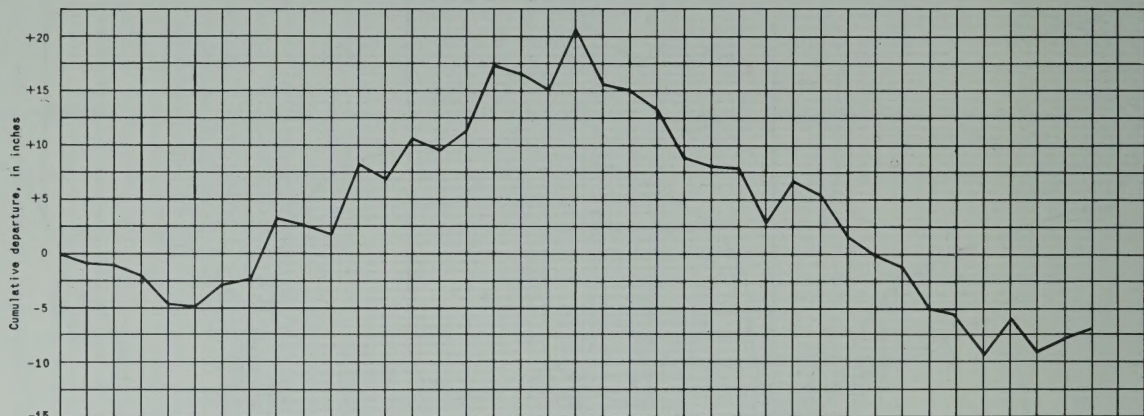
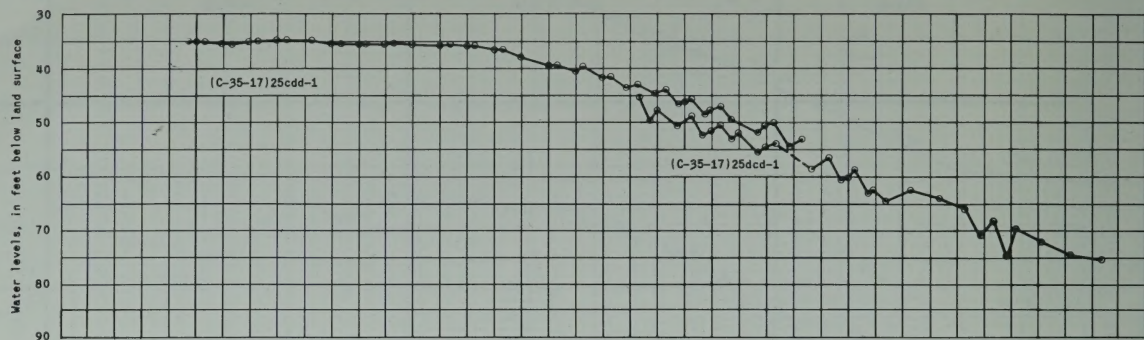


Figure 35.—Relation of water levels in wells (C-35-17)25cdd-1 and (C-35-17)25dcd-1 to cumulative departure from the 1931-60 normal annual precipitation at Modena and to pumpage for irrigation in the Beryl-Enterprise district, Escalante Valley.

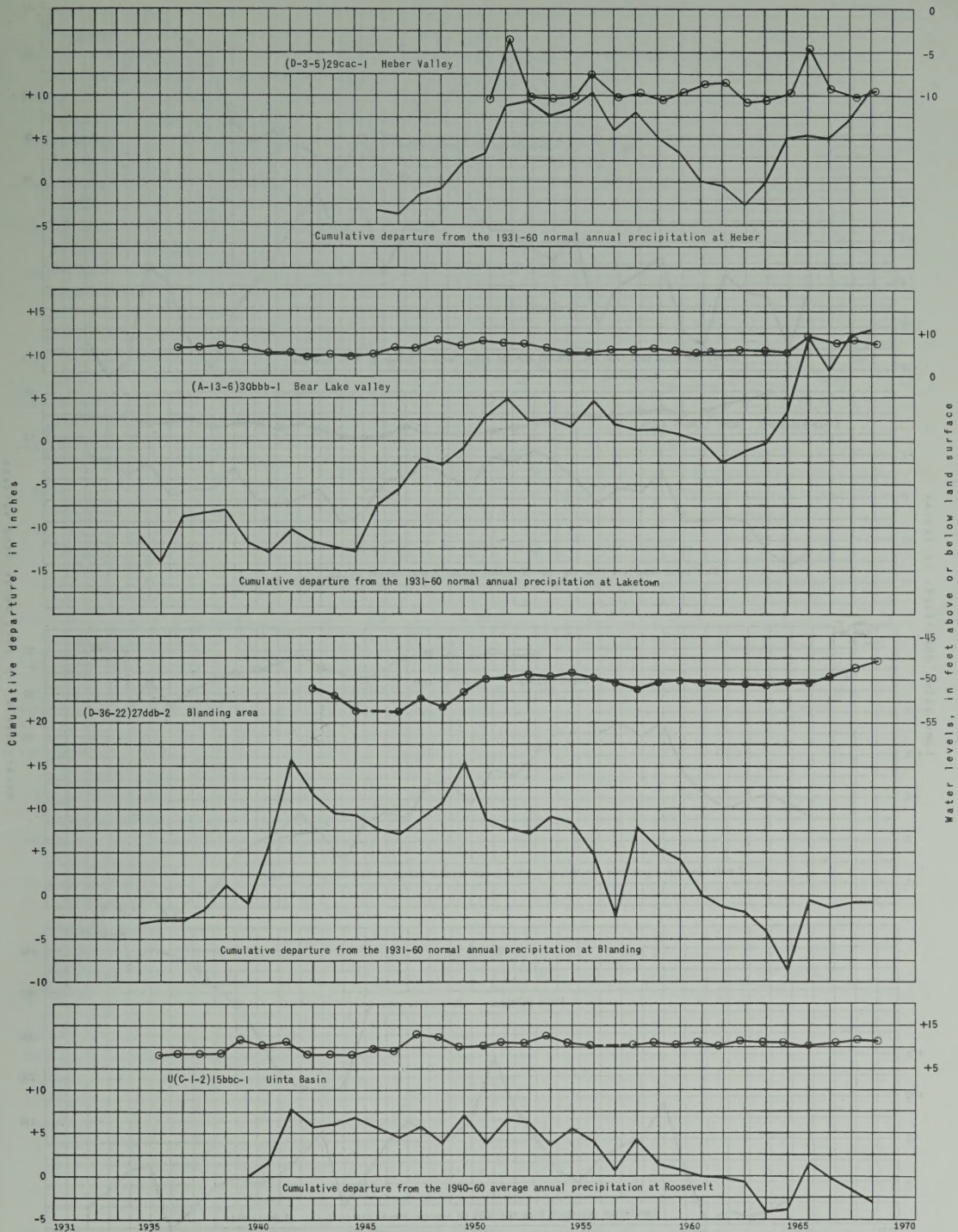


Figure 36.—Relation of water levels in wells in selected areas of Utah to cumulative departure from the average annual precipitation at sites in or near those areas.

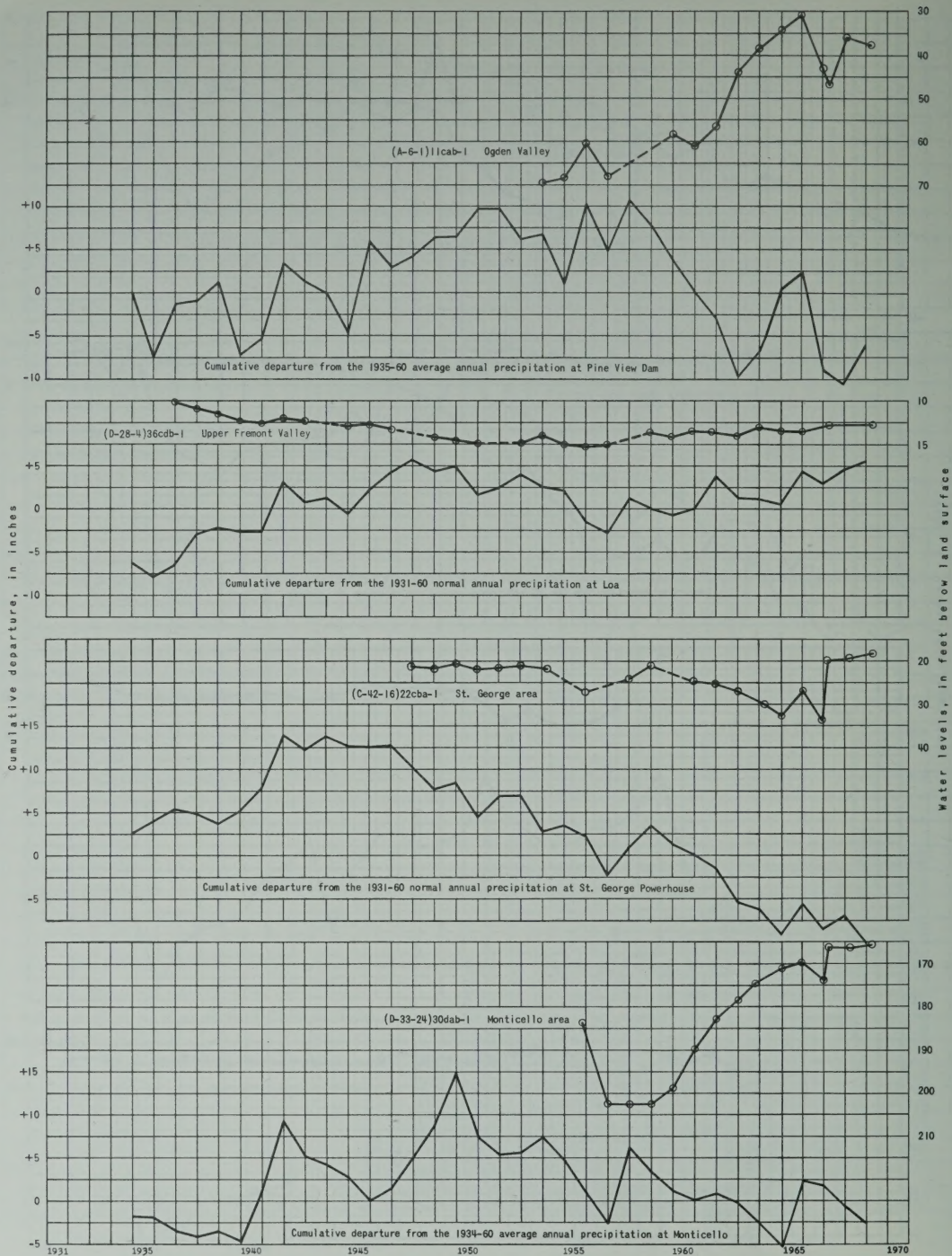


Figure 36.—Continued.

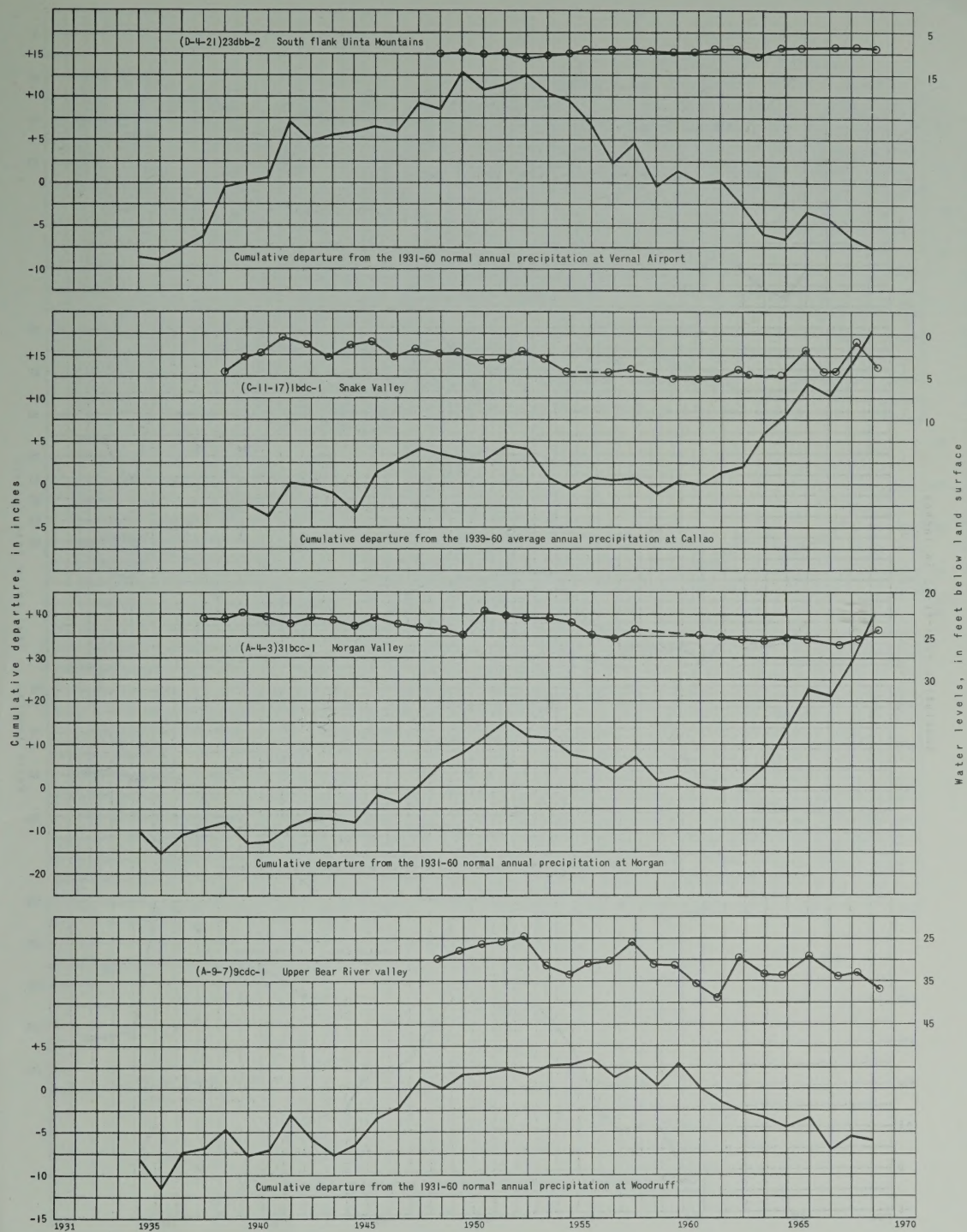


Figure 36.—Continued.

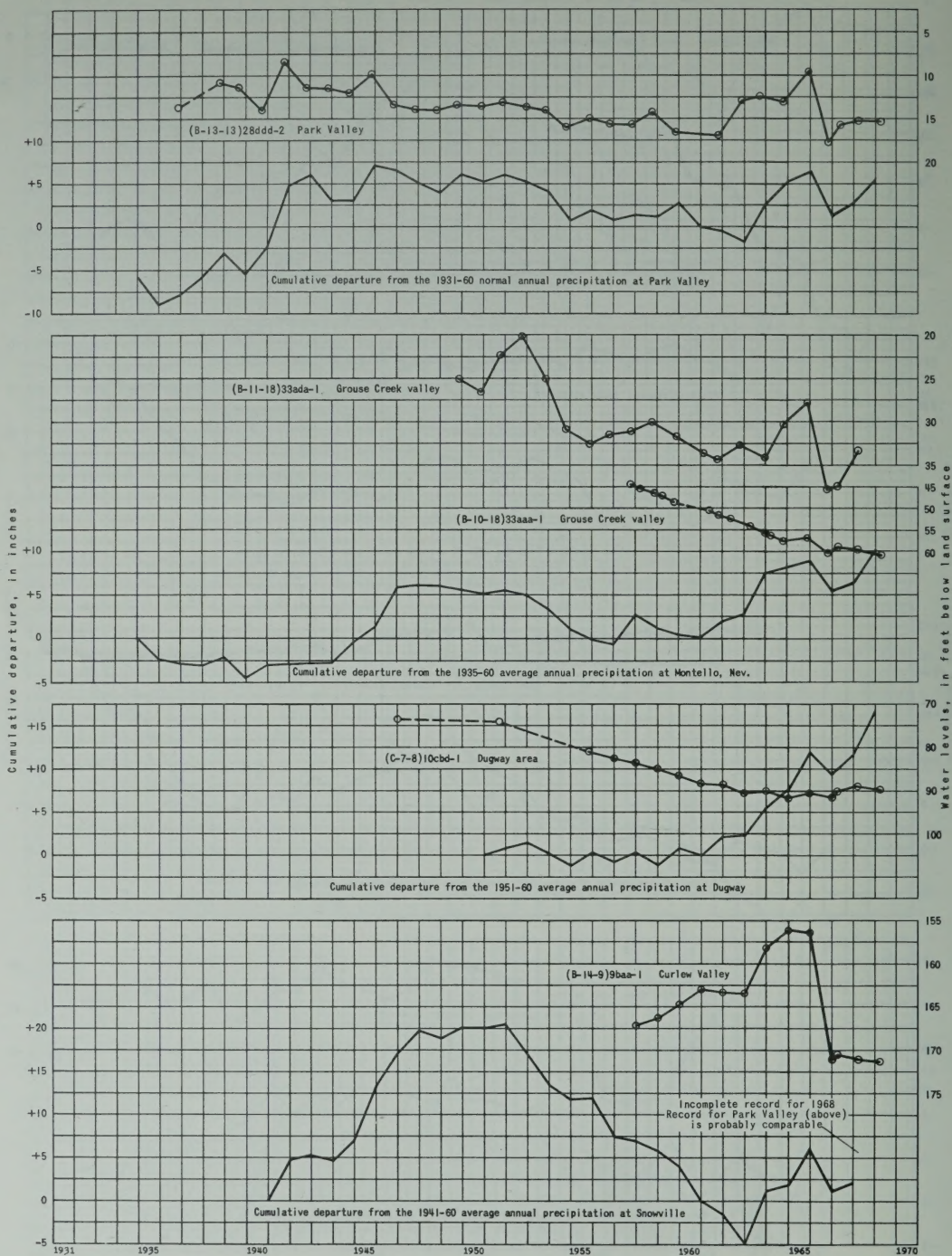


Figure 36.—Continued.

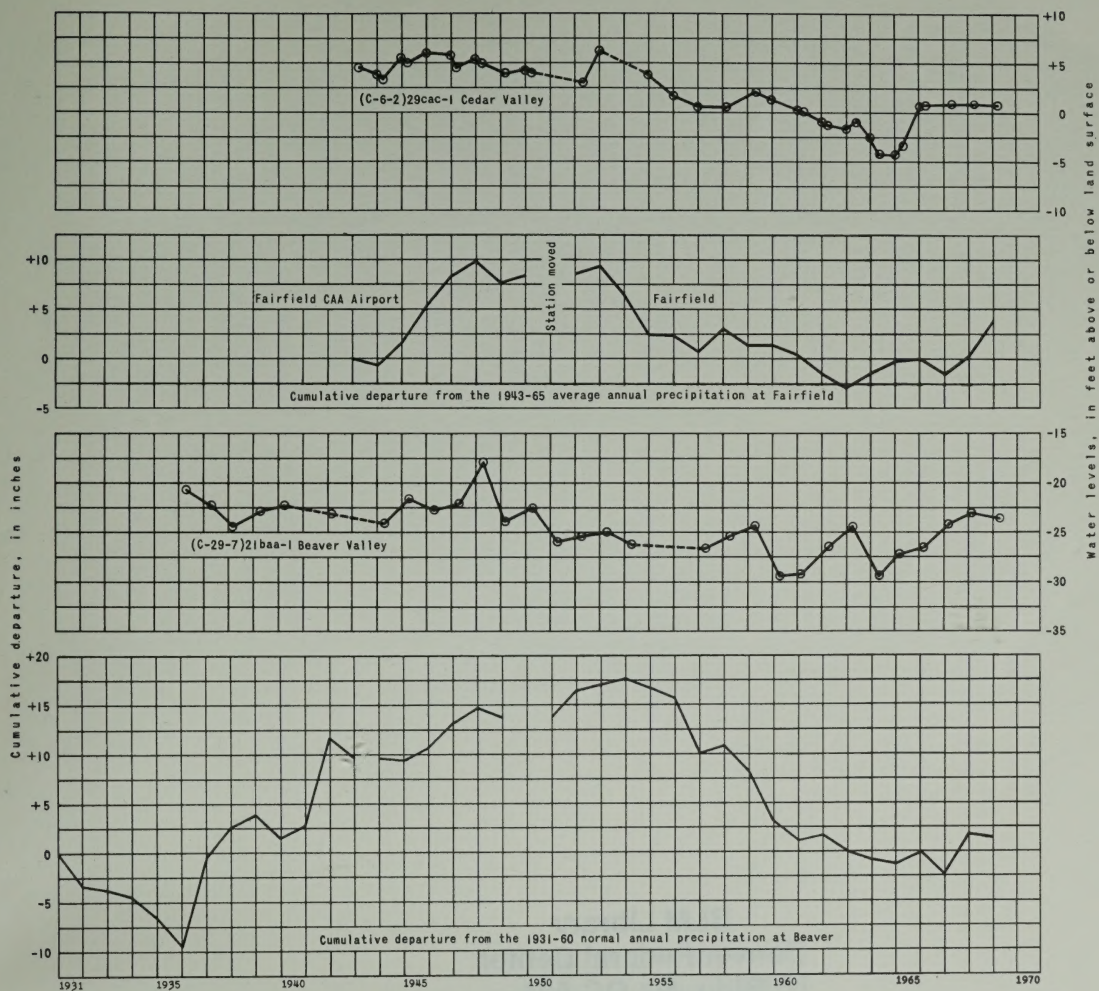


Figure 36.—Continued.

BLM Library
Denver Federal Center
Bldg. 50, OC-521
P.O. Box 25047
Denver, CO 80225

BLM Library
Denver Federal Center
Bldg. 50, OC-521
P.O. Box 25047
Denver, CO 80225

